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ABSTRACT

Ten lessons are included in this interdisciplinary unit on navigation, designed to supplement fifth and sixth grade social studies and science curricula. Each lesson includes: (1) lesson concepts; (2) competency goals; (3) objectives; (4) materials; (5) list of key vocabulary words; (6) background information; (7) teacher preparation; (8) list of student activities; (9) questions for students to answer; and (10) a short bibliography. Activities are designed to foster inquiry, manipulative, creative organizational, communicative, and measurement skills and to enable students to develop a better understanding of: (1) their maritime heritage; (2) some problems navigators faced in the 16th and 17th centuries; (3) the history and development of navigational instruments; and (4) the importance of celestial navigation. A packet of materials to be duplicated for student use is included. (JN)

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# PROJECT CAPE TEACHING MODULE

Developed under an ESEA Title IV-C Grant

Dare County Board of Education
P. O. Box 640
Manteo, North Carolina 27954

Dr. Carolyn H. Hampton
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| | |
|---|---|
| **TITLE:** | **NAVIGATION** |
| **GRADE LEVEL:** | **5-6** |
| **SUBJECTS:** | **Language Arts, Social Studies, Science, Art, Drama, Reading, Mathematics, Music** |
| **SKILLS:** | **Inquiry, Manipulative, Creative, Organizational, Communicative, Measurement** |
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## UNIT CONCEPTS

### WATER AND SOCIETY

Water influences history and human culture.

1. Water influences the development of civilizations.
2. Water availability influences where poeple live.
3. Water is a medium of transportation, commerce and communication.
4. Water availability shapes industry, agriculture and commerce.
5. Water plays a role in shaping our customs and beliefs.

### WATER AND HUMAN EXPRESSION

Water influences human aesthetic and spiritual values.

1. Water inspires creativity in art, literature and music.

# PREFACE

Today's youth will soon be assuming important roles as adult citizens in our society. To an increasing extent the decisions which they will be asked to make and the votes they cast will be concerned with the environment. As teachers, we need to assist our young people in acquiring the experiences, knowledge and concern necessary for making informed environmental decisions.

Project CAPE has embarked on a comprehensive marine education program to be infused into the K-12 curriculum and link with subject matter areas which most closely relate to the coastal environment. This publication contains a collection of navigation activities to supplement the fifth and sixth grade social studies and science curriculum. It is hoped that these activities will enable you to help your students obtain a fuller understanding of: (1) their maritime heritage, (2) some of the problems navigators faced in the 16th and 17th centuries, (3) the history and development of navigational instruments, and (4) the importance of celestial navigation.

## EXPLANATION OF CODING SYSTEM

## FOR SUPPLEMENTARY MATERIALS

| GRADE LEVELS AND SUBJECTS | CODE |
|---|---|
| K-2 Multidisciplinary | K-2a, K-2b, K-2c |
| 3-4 Multidisciplinary | 3-4a, 3-4b, 3-4c |
| 5-6 Multidisciplinary | 5-6a, 5-6b, 5-6c |
| **SECONDARY SCHOOL** | |
| English | ENG |
| Occupational Education | OE |
| Social Studies | SOC |
| Science | |
| Life | SC1 |
| Earth | SC2 |
| Biology | SC3 |
| **LESSON NUMBERS** | |
| 1 | 1. |
| 2 | 2. |
| 3 | 3. |
| etc. | etc. |
| **SUPPLEMENTAL MATERIALS** | |
| 1 | .1 |
| 2 | .2 |
| 3 | .3 |
| etc. | etc. |

**EXAMPLES**

K-2a
1.1 Translates: a supplemental sheet, booklet or game number 1 that accompanies the 1st lesson of Unit K-2a for grades K-2.

SC2
6.4 Translates: a supplemental sheet, booklet or game number 4 that accompanies the 6th lesson in Unit SC2 for earth science.

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Lesson Number: 1
Subjects: Social Studies
Math
Skills: Manipulative,
Communicative,
Measurement

# THE FIRST STEP

## LESSON CONCEPTS

1. The European voyages of discovery in the 15th and 16th centuries were begun to find a western short cut to the trading centers of the Orient for silks, spices and perfumes.

2. The first attempt at English colonization of the New World occurred on Roanoke Island.

## COMPETENCY GOALS

1. The learner will know that change affects the lives of people.

2. The learner will evaluate information.

## OBJECTIVES

1. The student will be able to describe why the European voyages of discovery began in the 15th and 16th centuries.

2. The student will be able to list five items a sailor will need for a 16th century voyage across the Atlantic.

## MATERIALS

world map, copy for each student
crayons
illustration of a 16th century bark with dimensions, copy for each student

## VOCABULARY

| | | | |
|---|---|---|---|
| navigator | bark | Phillip Amadas | apprentice |
| expedition | colony | Arthur Barlowe | pinnace |
| Constantinople | | Sir Walter Raleigh | |

BACKGROUND INFORMATION

During the Middle Ages, the Turks captured Palestine and closed the Holy Land to Christian pilgrimages. The European Christians fought wars called the Crusades against the Turks to gain control of the Holy Land from about 1200 to 1400. For the first time Europeans saw spices, silks and perfumes. Some of the returning Crusaders brought the silk and spices to Europe. Soon the Europeans began trading with the people of the eastern Mediterranean Sea. Constantinople flourished as the trading center for the treasures of the Orient.

Unfortunately, the Turks captured Constantinople and closed it to the Europeans in 1453. Since the land routes to the Orient were closed, European countries decided to sail west to find an ocean route to the lands of silks and spices. Navigation soon became one of the most important occupations in Europe. Navigators were responsible for reading maps and sailing the ships to the Orient. Navigators were responsible for the vessels and crews and had to serve as an apprentice navigator before being given a ship.

Instead of finding an ocean route to the Orient, the Europeans discovered the New World. By the 1500's, Spain was leading the other European countries in the race for land in the New World. Spain dominated the lands in Central America, the Carribean Islands and Florida and was becoming the richest and most powerful nation in Europe. Queen Elizabeth I of England decided her country should try for some of the riches of the New World and granted Sir Walter Raleigh the privilege of sending expeditions to start new colonies in the New World.

On July 4, 1584, Captains Phillip Amadas and Arthur Barlowe, sent by Raleigh, found an entrance through the islands above Cape Hatteras near what is now Kitty Hawk, North Carolina. They landed and claimed the land in the name of Queen Elizabeth of England and named it Virginia. The land they discovered is now known as the Outer Banks of North Carolina.

After having been encouraged by Amadas' and Barlowe's report, Raleigh sent two other expeditions to the Outer Banks of North Carolina - one in 1585 and one in 1587. The latter group became known as the "Lost Colony" when it was discovered by a visiting supply ship to have vanished.

Even though none of Raleigh's colonies were successful, the attempts at colonization whetted the lips of a land-hungry England. In 1607 England finally established a permanent settlement in the New World at Jamestown, Virginia.

The early English colonists crossed the Atlantic in boats known as barks and pinnaces. Amadas' and Barlowe's men came in a bark that was about 60 feet long and weighed about 60 tons and a pinnace that was about 30 feet long and weighed about 30 tons. A bark is a sailing ship with three to five masts and a pinnace is a small boat that usually ferries supplies between ship and shore.

## TEACHER PREPARATION

Make duplicate copies of the world map and the 16th century vessels for each student.

## ACTIVITIES

I. Map Activities

1. Give each student a map of the world.
2. The student will color Palestine red and trace the route taken by the Crusaders from Europe to Palestine.
3. The student will color Spain blue and trace the route taken by Spanish explorers to the New World.
4. The student will color England green and trace the route taken by Raleigh's Explorers to the New World.

II. Journey to the New World

1. Inform the students that they will travel back in time to the year 1584. They are navigators on Amadas and Barlowe's ship to the New World. They will leave Plymouth, England in April and will arrive in the New World in July.
2. Give each student a picture of their ship, a 16th century bark.
3. Have three students measure the length and width of the bark in chalk on the floor and draw a general outline of the boat.
4. Have the students sit on the floor inside the outline of the ship.
5. Ask the students to list items that they will need on board ship during this journey and write their ideas on the board.
6. After the list is finished, ask the students which items could they do without and which items are not practical for the 16th century.

## QUESTIONS

1. Why did the Europeans begin to explore in the 15th and 16th century?
2. Why did England start exploring new lands?
3. Who sent Amadas and Barlowe to the New World?

4. Where did the English captains land?

5. If you had been a sailor on the first boat to see the New World, how would you describe it to your friends in England?

SOURCES

King, Allen, Ida Dennis, and Florence Potter. The United States and Other Americas. New York: MacMillan, 1978.

Lefler, High. North Carolina History told by Contemporaries. Chapel Hill: The University of North Carolina Press, 1934.

Lesson Number: 2
Subjects: Language Arts
Reading
Skills: Organizational
Creative
Communicative

# DEAR DIARY

## LESSON CONCEPT

Diaries are valuable records of the past that historians use to learn how people lived.

## COMPETENCY GOALS

1. The learner will have a sense of time and chronology.
2. The learner will be able to clarify and organize ideas and feelings before writing.
3. The learner will be able to compose a piece of writing with an appropriate and consistent point of view.

## OBJECTIVE

The student will be able to compose a diary with ten entries in standard English relating his/her experiences on an imaginary sea voyage.

## MATERIALS

construction paper
notebook paper
crayons
entry dates
famous diaries such as Diary of Anne Frank and Diary of Samuel Pepys
dictionaries
thesaurus

## BACKGROUND INFORMATION

Diaries are written records of the events, experiences and observations of individual's daily life. Historians have used diaries, journals and letters to learn more about actual events and peoples' perception of those events. Diaries often reveal little known facts that are able to explain why people acted in certain ways or events took place.

Arthur Barlowe and Philip Amadas commanded the first ships sent by Raleigh to explore and claim land for England. Barlowe and Amadas left Plymouth, England in April 1584 and by May had sailed to the Canary Islands. In June they had reached the West Indies and stayed about two weeks, then left resupplied with food and water. In early July, Barlowe and Amadas sighted land and subsequently landed. During July and August the Englishmen explored the new lands and became acquainted with the Indians. Probably in late August the Englishmen left because they were back in England in the middle of September.

Following are quotes and excerpts from Arthur Barlowe's letter to Sir Walter Raleigh.

> "The 27th day of April, in the year of our redemption, 1584, we departed from the west of England, with two barks well furnished with men and victuals,"
>
> "We viewed the land about us, being where we landed very sandy and low toward the water side, but so full of grapes as the very beating and surge of the sea overflowed them, of which we found such plenty, as well there as in all places else, both on the sand and on the green soil, on the hills as in the plaines, as well on every little shrub, as also climbing towards the tops of high cedars."

## TEACHER PREPARATION

Make duplicate copies of entry dates for student diaries. Collect examples of famous diaries.

## STUDENT PREPARATION

Students will make their diaries, covered with construction paper and 10 pages inside for writing. Students should decorate their covers.

## ACTIVITIES

I. Introducing Diaries

1. Discuss with the class the word 'diary'. Ask if anyone has kept a diary or read one.
2. Show the students examples of famous diaries.
3. Read some entries from the Diary of Anne Frank.

II. Student Diaries

1. Ask students to imagine that they are going to travel as part of the crew of Amadas and Barlowe in 1584. They are going on a long voyage to the New World to explore and claim land for England. Encourage the students to relate the events that may occur on the voyage, to be included in their diaries.

2. Give each student a list of entry dates which will cover leaving England, the voyage, landing in the New World, meeting Indians, and the voyage back to England.

3. Each student should write on each entry date on a separate page.

4. Encourage students to fill in entries as the class works on activities in this unit. At the end of the unit, the student should hand in their completed diaries.

5. Allow students to write the first entry, April 27, 1584.

QUESTIONS

1. What is a dairy?

2. Why are diaries valuable to historians?

3. List one or more famous diary.

4. Should historians believe everything that is written in diaries? Why?

SOURCES

Corbitt, David Leroy. Explorations, Descriptions and Attempted Settlements of Carolira, 1584-1590. Raleigh: State Department of Archives and History, 1953.

REFERENCES

Frank, Anne. Diary of Anne Frank. New York, N.Y.: Modern Library Incorporated, 1958.

Pepys, Samuel. Diary of Samuel Pepys. New York, N.Y.: AMS Press, Inc.

Lesson Number: 3
Subjects: Music
Science
History
Skills: Manipulative,
Inquiry
Creative

# HO! HO! HO! AND A BOTTLE OF RUM

## LESSON CONCEPT

1. Sea chanties were sung to help keep sailors in rhythm when doing strenuous work.

2. The food on sailing ships was often spoiled and contributed to the poor health of the sailors.

## COMPETENCY GOALS

1. The learner will develop skills in singing.

2. The learner will develop skills in rhythm.

3. The learner will demonstrate knowledge of the relationship between food consumption and health.

4. The learner will comprehend the effect of nutrient deficiency on the human body.

## OBJECTIVES

1. The student will be able to sing sea chanties.

2. The student will help prepare and eat a typical sailors' meal.

3. The student will understand the role that vitamins play in maintaining a healthy body.

## MATERIALS

record of sea chanties
duplicate copies of sea chanties lyrics
1 record player
ingredients for SAILOR'S MENU recipes
pots, pans, utensils for cooking
duplicate copies sailor's menu and recipes
paper plates and cups per student
plastic flatware
copies of Vitamin Activity Sheet

## VOCABULARY

chanty grog scurvy "limey" citrus
hardtack deficiency

## BACKGROUND INFORMATION

Sea chanties (pronounced shan tees) were sung by sailors to help get work done. The rhythm of the songs helped the sailors to pull the ropes at the same time when raising and lowering sails or the anchor. One man who usually knew most of the verses was assigned to sing the lead, while everyone else joined in on the chorus. The sea chanties were often about girlfriends left at home, the hard life of the sailors and the weather.

Sailors on 16th century vessels had a very hard life - far different from the sailors of today. There were no refrigerators so all food had to be dried or salted. Only early in the voyage did the sailors enjoy fresh food such as vegetables or chickens (which they carried live in cages). Sailors' diets were very poor. Many times the food spoiled on long voyages. Frequently, mealworms appeared in the supplies of flour and hardtack stored as food. The sailors were forced to eat this flour and hardtack because there was no other food on board. The sailors had to pick out the beetles. There were no cooking stoves as we know them. Meals were cooked on deck over charcoal. During stormy weather, sailors did not receive hot food because fires could not be started.

Sailors and explorers often suffered from a disease known as scurvy. Scurvy was a result of a deficiency of Vitamin C in the body. It is characterized by weakness, bleeding gums, bleeding under the skin and sometimes resulted in death. In 1536 Jacques Cartier, a French explorer in Canada, saved some of his men from dying of scurvy by drinking a water extract of pine needles, an Indian remedy. In the 1700's, Lind proved that fresh citrus fruits would prevent or cure scurvy in sailors. In 1795 the British Navy adopted the procedure of adding lime juice to sailors food to ward off scurvy. British sailors have since been known as "limeys."

## TEACHER PREPARATION

Duplicate copies of the sea chanty lyrics and have a tape recorder available to play the sea chanty tape. Duplicate copies of the Vitamin Activity Sheet. Ask the students' parents to help with the food by sending a letter home with students with items needed (food, paper plates, cups, plastic flatware). Ask the lunchroom staff permission to cook on their ranges and ovens. A record "Songs of the Clippers" that has four sea chanties can be ordered from: Droll Yankees Inc., Mill Road, Foster, Rhode Island, 02825. Cost is $2.50.

## STUDENT PREPARATION

Have the students bring in needed items for the sailors meal (food, eating utensils and cooking utensils).

## ACTIVITIES

I. Singing Sea Chanties

1. Give each student copies of the sea chanties.
2. Let the students listen to a tape of the sea chanties.
3. Allow the students to sing along with the tape.
4. Let the students sing without the tape while pretending to pull the ship's anchor on board.

II. Sixteenth Century Seaman's Meal

1. Pass out the menu and recipe sheet.
2. Divide the class into cooking details.
3. Prepare the meal with the food and recipes.
4. Serve the meal.
5. Tell the children that sailors usually received a portion of grog (a fermented drink) instead of water since the drinking water was often foul. Students should pretend that their water is grog.

III. Vitamins

1. Give each student the vitamin activity sheets.
2. Tell each student to read the material and answer the questions on vitamins.
3. Discuss the answers to the questions.

Lesson Number: 4
Subjects: Science
Skills: Manipulative,
Inquiry,
Measurement

# NORTH BY NORTH

## LESSON CONCEPT

Early sailors and explorers had to use the position and the location of stars to navigate in the northern hemisphere.

## COMPETENCY GOALS

1. The learner will demonstrate the ability to observe.
2. The learner will demonstrate the ability to experiment.
3. The learner will have a basic understanding of stars.

## OBJECTIVES

1. The student will be able to locate east and west by the position of the sun.
2. The student will be able to locate north during the day by using a match or toothpick and a wrist watch.
3. The student will be able to locate Polaris by using the pointer stars, Dubhe and Merak in the constellation Ursa Major.

## MATERIALS

toothpicks or match
duplicate copies of constellation
old ping-pong paddle
3" x 5" note cards
instructions for assembly of star gazer
plexiglas 12" x 12"
wood 9" long
grease pencil
wrist watch
wood screws
wood 12" long

## VOCABULARY

| | | | |
|---|---|---|---|
| celestial | Polaris | Merak | Ursa Major |
| horizon | Dubhe | constellation | Ursa Minor |

BACKGROUND INFORMATION

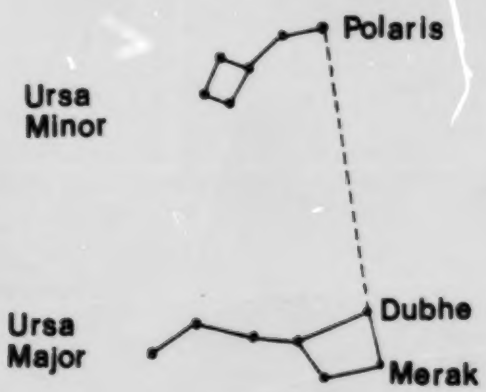
It is easy to understand how a sailor who stays within sight of land may not lose his way as he travels along the coastline. For many years sailors sailed only along coastlines. How did ships sail on the vast ocean without any landmarks to tell where it was? The navigators became experts at reading the stars, they became celestial navigators.

On a clear night we can see an unknown number of stars in the sky. Many of the stars are important to us as guide posts. The stars form definite patterns that we can follow as they appear to move across the sky through the seasons.

There is one star that appears to stay in the same place and the other stars appear to move around this one star, Polaris, or the North Star. It is called Polaris because it is almost directly over the North Pole. If you can find Polaris, you will be able to know which way is north.

Because Polaris is not a very bright star, you can use the Big Dipper constellation to locate it. The Big Dipper or Ursa Major (Big Bear) can be seen on any clear night in the northern hemisphere.

The two stars on the outer edge of the dipper are called the pointers Dubhe and Merak. If you draw a line that is five times the distance between Dubhe and Merak, you will find Polaris.




Polaris is the first star in the handle of the Little Dipper Constellation. The Little Dipper is also known as Ursa Minor (Little Bear) and Polaris is the star in the tip of the bear's tail.

If sailors were sailing at night, they could easily determine directions by using the position of Polaris. If the sailor would face Polaris, north would be in front of him/her, east would be to his/her right, west to the left and south would be behind him/her.

## TEACHER PREPARATION

Duplicate copies of the constellation drawings, data sheets and instructions for making star recorder. Make the star recorder according to instructions. Inquire if any of the students' parents would make a star recorder for the class. Check with the Industrial Arts class at the local junior high or high school to have star recorders made.

## ACTIVITIES

I. Finding Directions During The Day

a. Hold a wrist watch level in you hand in the bright sun.

b. Place a match, toothpick or other thin stick straight up on its end over the center of the wrist watch.

c. Turn the watch until the shadow of the stick is lined up with the hour hand.

d. North will be in the direction of the shadow and the hour hand.

II. Finding Directions At Night

a. Locate the Big Dipper.

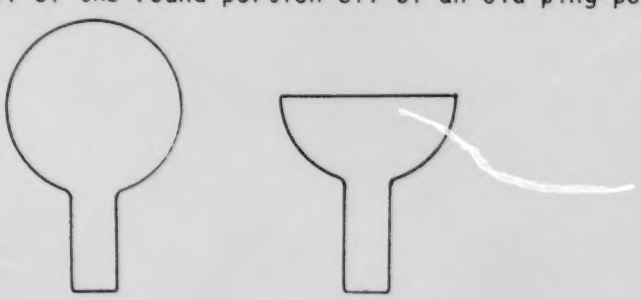
b. Find the two pointer stars Merak and Dubhe.

c. Imagine a line between Merak and Dubhe and extend the line five times until you see Polaris.

d. If you face Polaris, you will be looking north. East will be at your right, west will be at your left and south will be behind you.

III. Making A Star Recorder

a. Cut half of the round portion off of an old ping-pong paddle.



b. Attach a 12" piece of wood to the paddle with wood screws.

c. Attach the 12" x 12" piece of plexiglas to the support with 4 wood screws.

d. Glue a 9" piece of wood to the support with wood or furniture glue. Glue a small piece of triangular wood for support under the 9" piece.

e. See Star Recorder illustration sheet for diagrams of completed Star Recorder.

IV. Using The Star Recorder

a. Sight the plexiglas toward the constellation you wish to record.

b. Place your chin against the wooden spacer. This keeps your eyes an equal distance from your work.

c. Use a grease pencil to mark the plexiglas as the stars shine through. Mark the brighter stars with bigger dots.

d. Use note cards to record the constellation pattern from the plexiglas.

SOURCES

Nature and Science, The Natural History Press: Garden City, N.Y., June, 1965.

Lesson Number: 5
Subjects: Science
Skills: Manipulative,
Inquiry,
Measurement

# EAST IS WEST?

## (Using a Starfinder)

## LESSON CONCEPT

Star maps and star finders make it easier to locate and identify stars and constellations.

## COMPETENCY GOAL

The learner will select and use materials and equipment appropriate to personal needs and classroom assignments.

## OBJECTIVES

1. The student will be able to assemble a starfinder chart.
2. The student will be able to read a star map and use a starfinder to locate stars and constellations.

## MATERIALS

ballhead pins
almanacs (Farmer's)
duplicated star maps
opaque projector

Star finders are available from:
Edmund Scientific Co.
Barrington, N.J. 08007
(24 for $12.00)

## VOCABULARY

Zenith almanac ephemeris altitude

## BACKGROUND INFORMATION

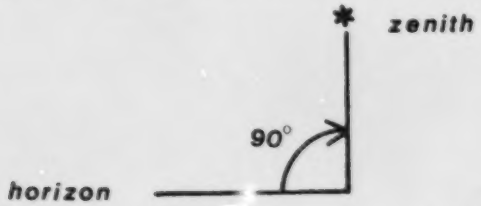
When you point to a star in the sky, it is often difficult for a companion to know which star you mean. Star maps and starfinder charts are like "road maps of the sky." Star maps are representations of the stars you would ordinarily see in a particular season. Starfinder charts include information: the name of the star; rising and setting

of stars; the constellation the star is in; the altitude of the star above the horizon; and the brightness of the star.

Starfinder charts show the best known constellations of the northern hemisphere. As the earth rotates on it's axis, stars appear to move across the sky and are at different locations at different times. The earth revolves around the sun every 365 days, causing us to see different stars and constellations at different times of the year. Starfinder charts enable students to find stars at particular times of the night and year.

When students use starfinder charts outside at night, it should be held upside down over their head. North of the starfinder chart must point to true north. A earth map's directional signs look like this: N W E S, but a starfinder looks like this: N E W S because you are looking overhead. When using a starfinder chart flat, place the direction you are facing at the bottom of the chart, or you can hold the chart overhead and point it in the actual direction.

The oval area of the starfinder chart is that part of the sky visible at a particular time of the year. The horizon is located at the edge of the oval. Stars are rising as they move into view from the edge and are setting when they disappear under the edge. When the star is directly overhead, it is at 90° altitude or its zenith.




To determine which stars will be seen tonight, turn the star disc until today's date is next to 8 P.M. The stars in the oval section will be seen at 8 P.M. if the sky is clear.

## TEACHER PREPARATION

Duplicate copies of star map, starfinder chart and have materials necessary for constructing starfinder charts. Make a large star map from the opaque projector. Ask students to bring almanacs from home.

## ACTIVITIES

I. Using The Starfinder Chart

a. Determine the direction your students face in the classroom.

b. Place the starfinder chart flat on a desk. Place the direction the students are facing nearest the student. If the students are facing east, position east in front of them.

c. Students could hold the chart overhead and point it in the actual direction.

d. Turn the star chart disc until today's date is lined up with the present time. Remember to keep the directions in the correct position.

e. Turn the star chart until today's date is lined up with 8 p.m.

f. Complete the student worksheet on starfinder charts.

II. Using Almanacs And Star Maps To Locate Planets

a. Place the large star map on the board.

b. Locate the visible planets on the star map during the month. Use different colors of ball head pins to represent various planets.

c. Distribute almanacs to each pair of students.

d. Find the explanation page of the almanac and show students how to find visible planets during the month.

SOURCE

MacBean, John C., Adam Stecher, Daniel F. Wentworth and J. Kenneth Couchman. Astronomy Examining Your Environment. Toronto, Canada: Holt, Rinehart and Winston of Canada, Limited, 1973.

Lesson Number: 6
Subjects: Science
Skills: Measurement, Inquiry

# TWINKLE, TWINKLE LITTLE STAR

## LESSON CONCEPT

The location of circumpolar constellations and other major winter constellations provide an introduction to stargazing.

## COMPETENCY GOALS

1. The learner will demonstrate the ability to observe.
2. The learner will have a basic understanding of the stars.

## OBJECTIVES

1. The student will be able to identify and locate three circumpolar constellations.
2. The student will be able to identify and locate three "winter constellations."

## MATERIALS

| | | | |
|---|---|---|---|
| shoe box | binoculars | coins | 3" x 5" note cards |
| flashlight | starfinder chart | telescope (optional) | |

## VOCABULARY

| | | | |
|---|---|---|---|
| circumpolar | constellation | Cepheus | Gemini |
| Cassiopeia | Rigel | Taurus | Castor |
| Orion | Canis Major | Aldebran | Pollox |
| Betelgeuse | Sirius | Pleiades | |

## BACKGROUND INFORMATION

Because of the earth's revolution around the sun, most constellations change during the seasons. The stars around Polaris or the North Star are seen in every season, they do not set below the horizon. These stars are known as the circumpolar constellations because they are situated around Polaris.

Polaris is in the constellation Usra Minor (Little Bear). Polaris is the tip of the bear's tail. Ursa Major (Big Bear) or Big Dipper is one of the more prominent circumpolar constellations. The other circumpolar constellations are: Draco (dra' coe), the dragon; Cassiopeia (kas ee a pee' a), the queen; Cepheus (see' fee us), the king; and Camelopardalis (ka mel' ō par' da lis), the giraffe. The name Camelopardalis, the giraffe, is of Greek origin meaning camel with leopard spots. The names of the circumpolar constellations are of Latin and Greek origins because of their civilizations early work in astronomy.

Draco is seen winding his way between Ursa Major and Ursa Minor. Cepheus is on the opposite side of Polaris away from Ursa Major, also Cepheus looks like a simple drawing of a house with the roof toward Polaris. Cassiopeia sits next to Cepheus, it appears as a simple M or W. Camelopardalis is on the opposite side of Polaris from Draco.

All constellations are not seen year round, most constellations change with the seasons. The easiest winter constellations to spot are Orion (ō rī' un), the Hunter; Canis Major (kā'nis ma' jur), the Big Dog; and Taurus (tar' us), the Bull.

Southeast of Orion's belt, the second brightest star in the sky is Sirius (sir' ē us), in the Canis Major constellation. Sirius is also known as Canicula (ka nik' u la) or the Dog Star.

Taurus, the Bull, forms a V-shape in the sky with its horns. Taurus is northeast of Orion. He can also be spotted by his red eye, the double star Aldebaran (al deb' a ran).

Other winter constellations that may be found are the Gemini (jem'i nī) twins, Pollux (pol' uks) and Castor (kas' tur). Pleiades (plē a dēz), the Seven Sisters is located near the shoulder of Taurus.

Stars have different colors and brightnesses. The brightness of a star depends on its distance from us and its actual brilliance. The color of stars indicate their temperature. The colors range from a brilliant blue-white to a dull red. The blue-white stars are the hottest with temperatures over 36,000°F. Red stars have the lowest temperatures around 5,500°F.

## TEACHER PREPARATION

Duplicate copies of the winter constellations and circumpolar constellations. Ask students to bring in shoe boxes from home. For the field astronomy activity, be familiar with stars location and planet locations by using an almanac; have binoculars in class; procure a telescope; bring flash lights; send letter home with students telling of the field trip, where and what time to meet.

## STUDENT PREPARATION

Students need to bring a shoe box for one of the activities. Students will need to wear warm clothing for field observations and bring their star finder charts.

## ACTIVITIES

I. Constellations Patterns

a. Give each student a duplicated copy of the winter constellations and the circumpolar constellations.

b. Allow the students to draw their own character representations of Draco, Cepheus, Canis Major and Taurus.

II. Constellation Projector Box

a. On one end of the shoe box, outline a coin and then cut a hole from the outline.

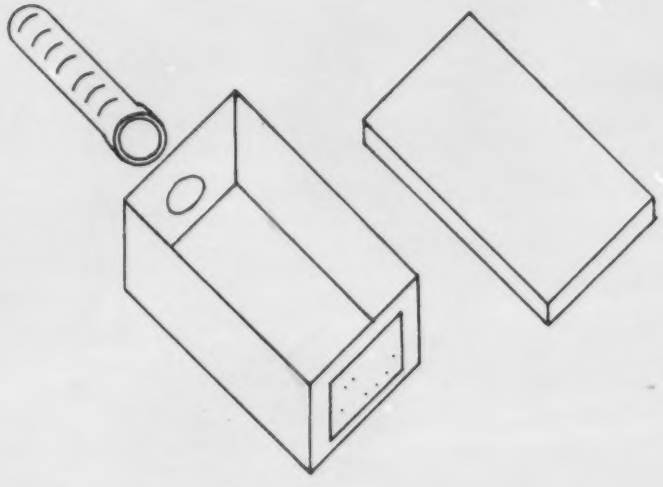
b. On the other end cut a square window, 7 cm x 12 cm.

c. On each 3" x 5" note card, draw the star pattern of each constellation.

d. Use a pin to make holes in the star's pattern on the note card.

e. Place the card over the projector window. Put the lid on the box.

f. Shine a flashlight through the opposite hole and aim it toward the wall, or just aim the box at a light and look through the hole.



III. Astronomy In The Field

a. Tell the students of the date and place for the field observations. Send a letter home with students requesting their parent's permission.

b. Remind students to wear warm clothing and bring star finder charts.

c. Students should meet at a designated location at school an hour after sundown.

d. Divide the class into 2 groups. One group should gather around the telescope to look for planets. The second group should use the star-finder charts to locate constellations. Flashlights can be used as pointers. Binoculars can be used to find planets.

QUESTIONS

1. What is a constellation?

2. What does circumpolar mean?

3. List three circumpolar constellations.

4. List three winter constellations.

5. Why do stars appear to rise and set?

6. Why do stars have different colors?

7. Why are some stars brighter than others?

8. Why did ancient people group stars together?

9. How would you group stars in a new constellation?

SOURCES

MacBean, J. C., A. Stecher, D. F. Wentworth, and J. K. Couchman. Astronomy Examining Your Environment. Toronto, Canada: Holt, Rienhart and Winston of Canada, Limited, 1973.

Nature and Science, 2, No. 4, (June 1965), 8.

Reed, Maxwell, Patterns in the Sky. New York, N.Y.: William Morrow, 1951.

Rey, H. A. Know the Stars. New York, N.Y.: Scholastic Book Services, 1962.

Lesson Number: 7
Subjects: Language Arts,
Creative Arts
Skills: Communicative,
Manipulative,
Creative

# CONSTELLATION MYTHS

## STORIES IN THE SKY

### LESSON CONCEPT

By knowing the patterns and stories given to constellations, students can more easily remember star positions in the sky.

### COMPETENCY GOALS

1. The learner will enjoy a wide variety of literature.
2. The learner will use literature for self-expression.
3. The learner will develop theatre art skills.

### OBJECTIVES

1. The student will be able to recognize the myths related to five constellations.
2. The student will demonstrate creativity in relating information to others.

### MATERIALS

myths about characters in constellations (books, news items, magazines, encyclopedias, etc.)
material for costumes
mural paper and other art supplies (paint, crayons, magic markers, etc.)
boxes, chairs, tables etc. to be used for props

### VOCABULARY

| | | | | |
|---|---|---|---|---|
| Orion | Cepheus | Gemini | Sirius | Scorpius |
| Cassiopeia | Castor | Pleiades | Taurus | Perseus |
| Andromeda | Pollux (Polydeuces) | | Procyon | |

## BACKGROUND INFORMATION

For thousands of years men have observed the patterns made by the stars at night. It was easy for some to make their stories match the pictures in the sky or even to make original stories for the characters they imagined. It was common among ancient civilizations to make up myths for events and phenomena they did not understand.

The winter sky makes an especially brilliant picture gallery. There is Orion, the mighty hunter on the banks of the river Eridamus. He threatens Taurus, the bull who carries Pleiades, the seven sisters on his back. The bull's horns are so long, it is good that Orion will never catch him! Crouching at Orion's feet is the timid rabbit, Lepus, and following behind are the two hunting dogs, Sirius and Procyon. The constellation Gemini, high overhead, could symbolize the sky in this heavenly hunt.

The sailors used the constellations to guide them. Orion signaled the storms of winter by causing a disturbance as he dropped into the cold November sea. The Pleiades also was used to mark the beginning of the navigational season, rising at dawn in late April when the gales of spring were over. In October the Pleiades heralded the return of bad weather. One did not sail when the Pleiades was visible in the night sky. They have always been associated with bad weather, rain, flood and death. The druids of Britain let loose a night of terror when Pleiades appeared in November - one of the reasons for the reenactment of Halloween.

## TEACHER PREPARATION

The teacher should gather books, magazines, films, filmstrips and encyclopedias about constellations and their myths. The teacher needs to have the items listed in MATERIALS section necessary for dramatization and artwork.

## ACTIVITIES

I. Communicating Constellation Myths

a. Divide the class into five groups. Each group will choose a myth about a constellation it wishes to study.

b. Several versions of each myth will be available to the group (books, magazines, films, filmstrips and encyclopedias).

c. After reading and studying their myth, each group narrates to the "recorder."

d. The "recorder" rewrites the myth to be placed in a class booklet of constellation myths.

II. Native American Myths

a. Read the story of the Iroquois Star Myths

III. Star In Your Play

a. Divide the class into five groups. Each group will decide how to present its myth to the class.

b. The presentation could be through art work such as a mural, writing a play, with puppets, whole body dramatization, music and dance interpretation.

SOURCE

Hawkins, Gerald S. Splendor in the Sky. New York, N.Y.: Harper and Brothers, Publishers, 1961.

REFERENCES

Marriott, Alice and Carol K. Rachlin. American Indian Mythology. Thomas Crowell Company, 1968.

Bennett, Michael A., Editor. "American Indian Sky Lore - A Bibliography." Planetarium Director's Handbook. Spitz Space Systems, Inc., Chadds Ford, PA: No. 33, (September-October, 1975).

Lesson Number: 8
Subjects: Science, History
Skills: Manipulative, Measurement, Creative

# WHERE AM I?

## LESSON CONCEPT

Early navigators and sailors were able to travel the oceans with simple navigational aids such as the compass, cross-staff and astrolabe.

## COMPETENCY GOALS

1. The learner will demonstrate the ability to observe.
2. The learner will know that change affects the lives of people.

## OBJECTIVES

1. The student will be able to explain the term latitude and will be able to find their own latitude by using their hands.
2. The student will be able to make a simple compass.
3. The student will be able to locate cities on a world map by using latitude and longitude.

## MATERIALS

compass:
- 8 small cork caps
- 8 needles
- 8 bar magnets
- 8 plastic margarine bowls

latitude-longitude games:
- paper ships and airplanes
- world map
- tape

duplicated copies of navigation instruments
duplicated copies of longitude-latitude illustrations
duplicated copies for hand measurement

astrolabe:
- 8" diameter wooden or cardboard wheel
- drill
- protractor
- string for loop
- fishing weight
- 2 straight pins
- drinking straw
- 7" piece of softwood
- bolt
- wing nut
- 3 washers

cross staff:
- 3" stick
- 5" stick
- 18" stick
- 2 3½" carriage bolts
- 2 wing nuts
- protractor
- drill

## VOCABULARY

| | | |
|---|---|---|
| longitude | compass | horizon |
| latitude | chronometer | Polaris |
| astrolabe | cross staff | altitude |

## BACKGROUND INFORMATION

Early sea traders were able to navigate by sailing along familiar coasts. As sailors moved away from the coast and into the oceans they became to depend upon celestial navigation. Sailors used Polaris, the North Star, to sail at night. To travel west he had only to keep the Pole Star over his right shoulder. For any latitude (the number of degrees an object is above the equator) at which Polaris can be seen, its altitude (measure of an object above the horizon) is the same. To sail a course due east or west, the sailor in the northern hemisphere merely had to keep a constant angle between Polaris and the northern horizon.

After navigators realized the stars were in a certain spot each night, they were able to find their latitude position by measuring the altitude of a particular star and referring to a table which contained star altitudes and latitude positions.

By the late 1400's the mariner was able to chart and find his latitude by the sun and stars. The invention of the magnetic compass opened the way for sailors to venture out in the seas in bad weather. The compass had been around since ancient times. The Vikings used a primitive compass - a magnetized needle-like object inserted into something which would float. The needle was then placed into a bowl of water and it would point towards the magnetic North Pole. In times past, sailors had to be able to "box the compass" or be able to name all the cardinal points (North, East, South and West) and the intermediate points (Northeast, North by Northeast, etc.). Today this has been eliminated by the numbers near the outside edge of the compass dial

which represent degrees (5-6b, 8.2). A degree is a unit of measure for describing an angle. A circle is divided into 360 degrees (360°). On a compass, degrees are counted in a clockwise direction from North. East is 90° clockwise from North. If a navigator takes a heading of 180° it means he is heading South.

By the 15th century the altitude of stars was being measured by the astrolabe and the cross-staff. Many sailors used the cross-staff to measure latitude and altitude after it was introduced in 1325. The cross-staff consisted of a staff about a meter long and 2 cm square in thickness. Crosspieces known as transversaries were added to the staff. The transversary could be slid along the staff that was graduated from 20° to 90°. The cross-staff would be aimed at a star and the transversary would be adjusted so that it occupied the angle between the celestial body and the horizon. The latitude was read by degree marks cut by transversary along the staff.

The astrolabe (as'tro labe) or seamen's ring was a metal disc marked in degrees of arc and suspended from a small metal ring. A sighting vane that could be rotated a full circle was affixed to the center of the disc. The altitude of the star was found by sighting the star along the vane. Astrolabes were not very reliable on vessels that were rolling and pitching.

Astrolabes, cross-staffs and the magnetic compass enabled mariners to find their latitude at sea. Unfortunately, longitude was much more difficult to find. Therefore, until the late 18th century, seamen were "latitude sailors." The essence of the problem of longitude was time. The solution to this problem lay with the invention of a reliable time piece, the chronometer, an exceptionally precise timepiece. With the invention of the chronometer and the establishment of Greenwich, England as 0° longitude, water transportation entered a new era.

## TEACHER PREPARATION

Gather the materials needed for the compass activity; bowls, magnets, cork, paper and water. Duplicate copies of the boat and airplane master and cut out and place the world map in front of the class. Duplicate copies of the directions for each student for hand measurement of time, altitude and latitude.

If the teacher does not wish to make the astrolabe or cross-staff let a student take the directions and make with his/her parents.

ACTIVITIES

I. Making A Simple Compass

a. Divide the class into 8 groups.

b. Each group should have; 1 bowl of water, 1 bar magnet, 1 large needle, 1 piece of cork.

c. The students should scrape the needle over the magnet in the direction of the north pole of the magnet. Always scrape the needle in the same direction - do not go back and forth.

d. Insert the needle through the cork and place it in a bowl of water.

e. To discover which end of the needle is north seeking take the bar magnet and place it near the needle. Remember that unlikes attract and likes repel.

f. Label the end of the needle which is north with a small slip of white paper.

II. May Day! May Day! Latitude-Longitude Game

a. Explain to the students that the term May Day is a distress call.

b. Place the world map on the board in front of the class.

c. Distribute the ships with latitude and longitude to the class.

d. Divide the class into groups of three. Each group is allowed to try to find where their ship went down by using the latitude-longitude coordinates.

d. The teacher should place 10 planes without latitude-longitude coordinates on the map and let the teams give the coordinates.

III. Measuring Time, Altitude And Latitude With Your Hands

a. Distribute the sheet with directions on how to measure time, altitude and latitude with hands.

b. Take the students into the school yard after lunch.

c. Have the students face the sun.

d. Tell the students to hold their thumb against the palm of their hand. Hold their arms out straight in front of them. Place your right hand in front of you so that it appears to touch the horizon and place the left hand on top of the right. Count hand over hand until you touch the sun.

e. Each hand is equal to 1 hour, this is the number of hours left until sundown.

f. Bring the students inside and tell them to try to find their latitude by measuring with their hands the distance to Polaris.

ENRICHMENT

I. Make A Cross-staff

a. Drill two holes about 4.5 cm apart in the center of each of the two smaller sticks.

b. Slip 3 1/2" carriage bolts through the holes and with wing nuts tighten the bolts together.

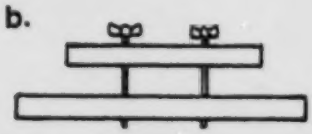
c. Put the long stick between the two short sticks.

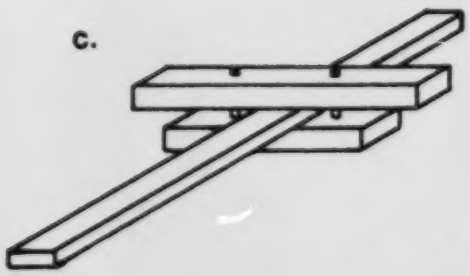
d. Use a protractor to mark the angles on the cross-staff.

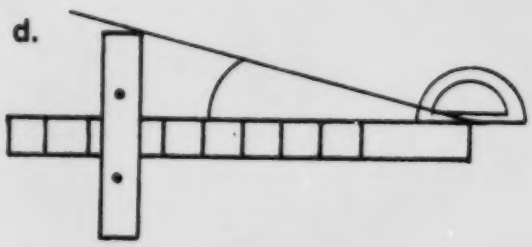
e. Keep the altitude stick straight.

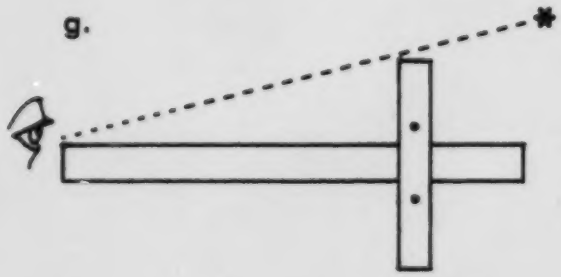
f. Use the wing nuts to adjust the cross-staff.

g. Hold the cross-staff at eye level along the horizon and sight Polaris to find your latitude.



II. Make An Astrolabe

a. Cut a wheel with a diameter of 21 cm out of wood or cardboard. Drill a hole in the center.

b. Mark degrees on the circle with a protractor as in the illustration.

c. Make a hanging loop and attach a fishing weight as in the illustration.

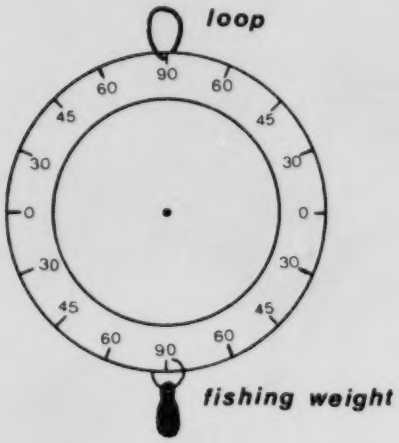
d. Drill a hole in the center of a 18 cm piece of soft wood.

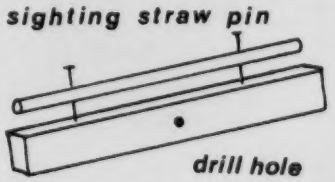
e. Attach a drinking straw with pins to a 18 cm piece of soft wood as in the illustration.

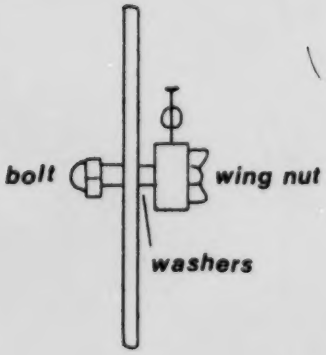
f. With a bolt, wing nut and washers assemble the astrolabe as in the illustration.

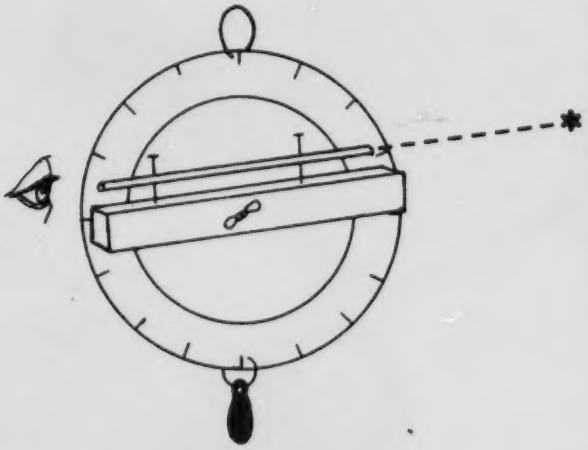
g. Hang the astrolabe from a steady support and sight Polaris to find your latitude.

h. Use the astrolabe only at night with stars.



QUESTIONS

1. How does a compass work?

2. What does "box the compass" mean?

3. Name some instruments that helped early navigators find their latitude.

4. Compare and contrast the terms latitude and longitude.

5. Why did the early sailors need navigational equipment?

SOURCES

Hellman, Hal. Navigation: Land, Sea and Sky. Englewood Cliffs, New Jersey: Prentice-Hall, 1966.

Jobb, Jamie. The Night Sky Book. Boston, Massachusetts: Little, Brown and Company, 1977.

Schweitzer, James P. "Evolution of the Sextant." LSU Marine Science and Teaching Aid, Issue 7, (October 1975).

Lesson Number: 9
Subjects: Math,
Social Studies
Skills: Measurement

# MODERN NAVIGATIONAL AIDS

## LESSON CONCEPT

The constant improvement of navigational tools has greatly improved the assurance of accurate and safe navigation of our seas.

## COMPETENCY GOALS

1. The learner will investigate some of the properties of coordinate geometry.

2. The learner will demonstrate the ability to use space/time relationships.

## OBJECTIVE

1. The students will be able to explain the functions of modern navigational aids such as sextant, gyroscope, gyrocompass, chronometer, radar, Loran and Shoran.

## MATERIALS

globe
compass
sextant
world map
illustrations of loran receiver
illustrations of radar receiver
illustrations of radar two-way antenna
Loran information
radar information

## VOCABULARY

| | | |
|---|---|---|
| sextant | gyroscope | gyrocompass |
| true north | shoran | chronometer |
| loran | meridian | |

## BACKGROUND INFORMATION

All the early nagivational tools and techniques were useful to seamen and they were constantly being improved. The cross-staff and

astrolabe were replaced by the sextant to find one's latitude by measuring the altitude of celestial bodies. The sextant has a telescopic lens for more accurate sightings and a vernier for more precise movement for measurement. Latitude could be determined well enough with earlier instruments and the sun, moon and stars - providing there was a nice clear day or night to sight the celestial bodies.

Mariners were still confronted with the problem of longitude. It was known that an accurate time-piece was needed to work on water and there was none. The problem of longitude is one in which local time at a given instance must be compared with the time at some datum or standard meridian. In 1714 the British Parliament set up the Board of Longitude, they offered a reward of up to 20,000 pounds to any person who would invent or discover a practical method for finding longitude at sea. In the 1730's John Harrison, a young clockmaker built a chronometer that weighed 65 pounds and had two pendulums that were joined by a spring that compensated for the ship's rolling motion. In the late 1800's it was decided to make Greenwich, England the 0° line, the prime meridian, from which longitude east and west is measured.

Navigation accuracy has constantly improved through refinements on existing equipment. The magnetic compass has been improved through the addition and merger of the gyroscope. The gyrocompass is able to maintain a north-south orientation and provide a stable directional reference, without disturbance from pitching and rolling waves. Gyroscopes are also used as stabilizers for ships, keeping them from extreme pitching and yawing in heavy seas.

Electronic navigation includes radio, radar, depth finders, sonar, loran and shoran. Depth finders measure the time a sound pulse takes to reach the bottom and return and then converts the delay in time into a depth reading. In radar a transmitter on the ship sends out a super high frequency signal (SHF) radio signal from a rotating two-way antenna. As the antenna rotates the SHF beam is reflected by nearby objects. The antennae picks up the reflections and a receiver translates them into electronic blips that are flashed onto a radarscope. Loran (long range navigation) is one of the most precise electronic navigation systems available to seamen. In Loran systems a radio transmits a master signal to two distant slave stations, which retransmits the signals. The seaman picks up both the master transmission and the slave transmission and measures the time elapsed between the signals. With this information the seaman uses a loran map to determine his location. Shoran (short range navigation) uses the same type of system as loran.

## TEACHER PREPARATION

Gather the needed materials for activity 1, globes and maps. In activity 2, try to procure as many navigational aids as possible for the

class to observe and handle or make duplicated copies of the illustration for the student. Ask someone from the Coast Guard or a Marine Sales Shop to bring some modern navigation equipment to your class. Order a film to show to your class. Plan a field trip to a fishing trawler or a large pleasure craft to see the navigational aids used.

## ACTIVITIES

I. Finding Your Way Through The Longitudes

a. Duplicate copies of the student worksheet.

b. Distribute the worksheet to each student.

c. Have globes, maps and charts available for the students.

d. After the students have finished their work, exchange papers and discuss the answers.

II. Modern Navigational Aids

a. Invite someone from the Coast Guard or a Marine Sales Shop to bring navigational equipment (compass, sextant, radar, loran, shoran) to your class for a presentation.

b. Duplicate the illustrations of navigational aids to give to the students or to make a visual display board.

c. Order one of these films to show to your class.

| | |
|---|---|
| "To Help Man Find His Way"<br>28 minutes, color | Modern Talking Pictures<br>1212 Avenue of Americas<br>New York, NY 10036 |
| "Modern Geodetic Survey"<br>16mm, 22 minutes, color | Navy Film No. MN10203.<br>Write to:<br>Assistant for Public Affairs<br>at the Local Navy District<br>office. |
| "The Shape Of The Earth"<br>16mm, 28 minutes, color | McGraw-Hill Text Films<br>330 West 42nd Street<br>New York, NY 10036 |

III. Field Trip

a. Plan a field trip to a fishing vessel or a large pleasure boat.

b. Explain to the vessel captain you would like a demonstration of some of the navigational equipment.

SOURCES

Hellman, Hal. Navigation: Land, Sea and Sky. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1966.

Loomis, Harvey B., Editor. Navigation, The Time-Life Library of Boating. New York, NY: Time Life Books, 1975.

Schweitzer, James P. "Evolution of the Sextant." LSU Marine Science and Teaching Aid, Issue 7, (October 1875).

Lesson Number: 10
Subjects: Reading
Skills: Communicative, Inquiry

# GET THE MESSAGE

## LESSON CONCEPT

Flags, pennants and coded lights are useful navigational tools for communication from craft to craft and port to craft.

## COMPETENCY GOALS

1. The learner will interpret pictorial materials.
2. The learner will locate and interpret information using a variety of sources.

## OBJECTIVE

The student will be able to interpret communicated messages from the International Flag and Pennant system for sea vessels.

## MATERIALS

copies of alphabet flags and numeral pennants
construction paper
glue
unlined white paper
crayons
scissors

## BACKGROUND INFORMATION

The use of flags for communication between vessels has existed for centuries. Flags were first used to designate ownership or nationality. As harbors and ports became crowded with trade ships it became necessary for a system of communication to prevent accidents and wrecks. Communication flags were important in naval wars in determining who was the enemy, maneuvering strategy at sea and aiding damaged ships.

## TEACHER PREPARATION

Free copies of the International Flags and Pennants may be ordered from the Insurance Company of North America, 1600 Arch Street, Philadelphia, Pennsylvania, 19101. Order enough for each two students.

## ACTIVITIES

I. Why Use Flags

a. Put a message on the blackboard with colored chalk using the International Flag System.

b. Ask the students to interpret the message.

c. Initiate a discussion of why the use of flags and color-coded lights is important to ships at sea. When would flags not be useful to the navigator?

II. Making Communication Flags

a. Give each two students a copy of the flag and pennant illustration or brochure.

b. Students should make their flags 10 cm x 13 cm with either construction paper or white paper with crayons.

c. The students should make sure the colors and shapes are correct.

III. "Get The Message" Game

a. Divide the class into teams of five or six members.

b. Each team takes a turn at sending a message to the other students.

c. The message can be single letter messages or multi-flag statements using all members of the team.

d. The other teams may use their charts to decode the message.

d. The team who decodes the message first gets 5 points.

e. After each team sends five messages, the team with the most points is the winner.

IV. "LAND HO!" Game

a. The object of this game is to safely navigate from Europe to the New World.

b. Prepare the gameboard of the "LAND HO!" game.

   1. Make a transparency of the gameboard.
   2. With an overhead projector, project an enlarged image onto a large piece of poster board and trace the board pattern.
   3. Have students color the gameboard.
   4. Laminate the board to make a more permanent game.

c. Cut out the Storm and Ill Wind cards with questions on the back.

d. Coins, paper clips or cork sail boats may be used for tokens.

e. Follow "Land Ho!" directions to play the game.

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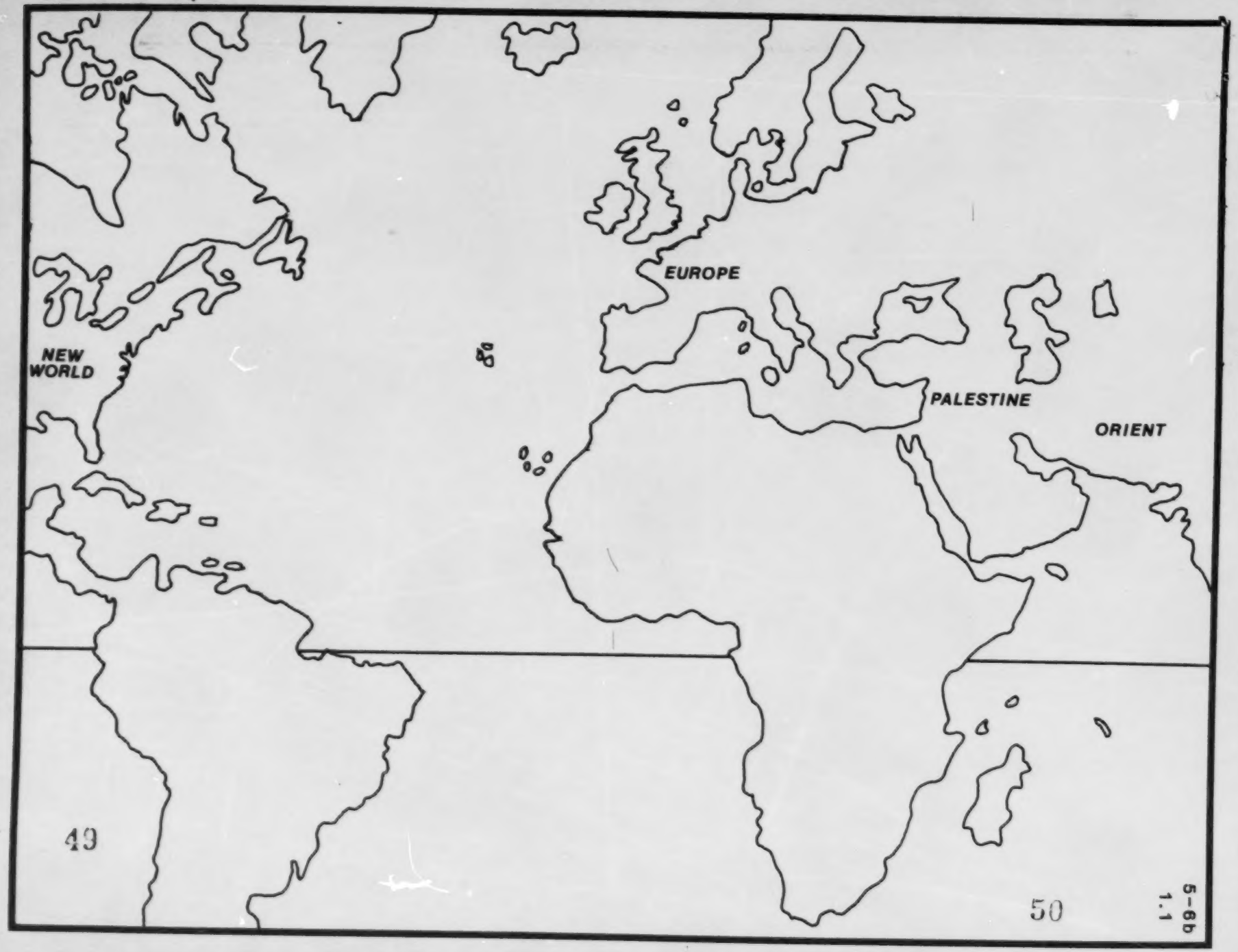
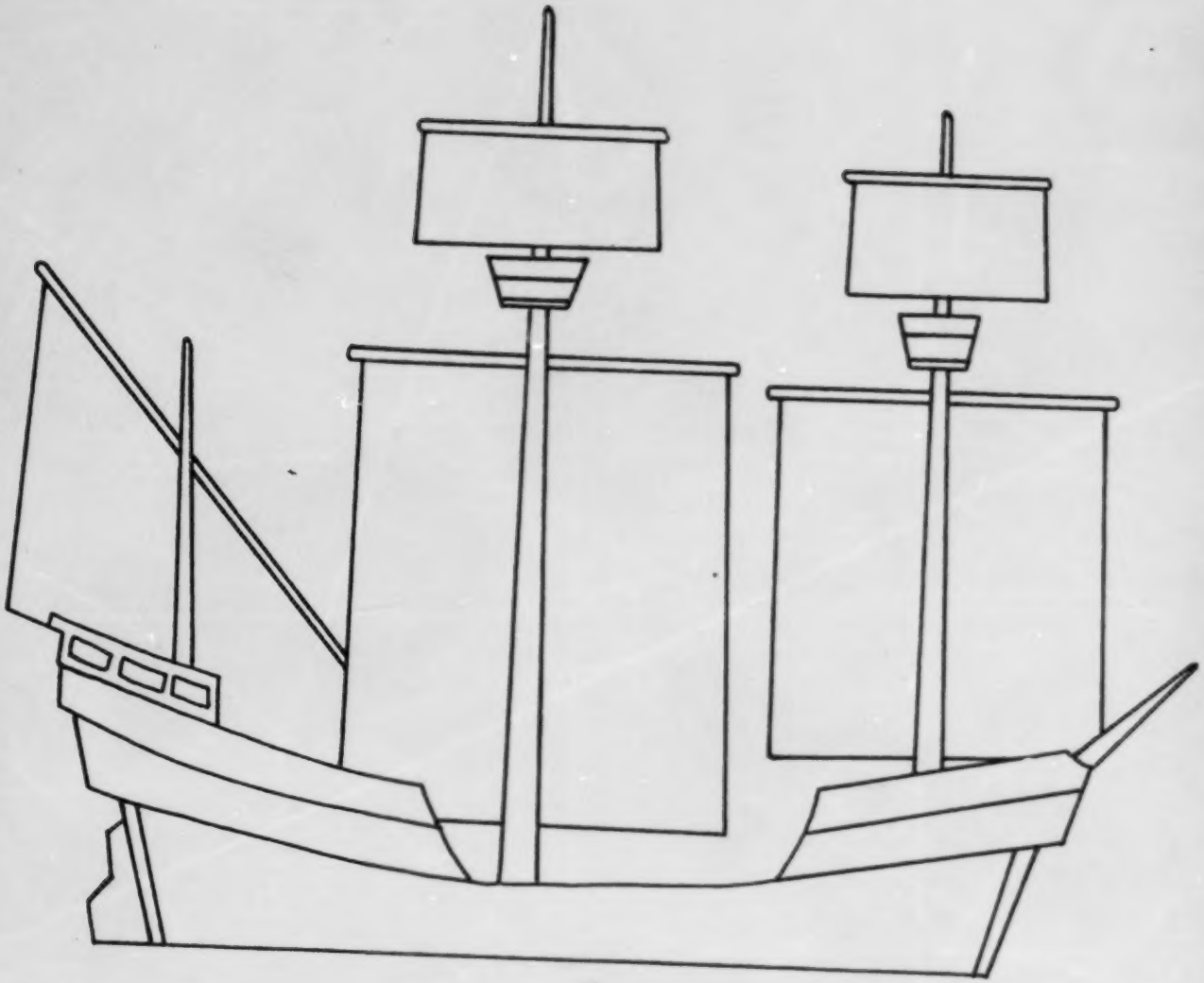




DIARY ENTRY DATES

April 27, 1584 - leave England

May 10, 1584 - reach Canary Islands

June 10, 1584 - reach West Indies islands

June 22, 1584 - leave West Indies, resupplied

July 4, 1584 - sight land

July 13, 1584 - land in the New World

August 7, 1584 - see first native Americans

August 8, 1584 - meet native American chief

late August 1584 - leave New World

middle of September, 1584 - arrive in England

## SAILOR'S MENU

Dinner:

Fried Salt Pork
Hardtack Biscuits
Stewed Dried Prunes
Grog (water)

## RECIPES

*Stewed Prunes

2 lbs. dried prunes  1 lb. sugar

Cover prunes with cold water; bring to a boil. Cover and reduce heat. Cook until tender (30-50 minutes). Add sugar during last 5 minutes of cooking.

*Fried Salt Pork

5 lbs. salt pork

Wash and cut the pork into slices. Fry in frying pan over medium heat, stirring occasionally. Continue frying until brown. Add small amounts of water while cooking.

*Hardtack Biscuits

8 cups flour  4 tblsp. baking powder
4 tsp. salt  1 1/2 cups vegetable shortening
3 cups of milk

Combine first four ingredients. Stir milk in gradually. Roll dough into 1/2" thick sheet and cut into 2 1/2" rounds. Place biscuits close together on a greased baking pan and bake in a hot oven 25 minutes.

# VITAMINS ACTIVITY SHEET

Vitamin comes from a word meaning life. We must have vitamins in our diet to have a healthy life. Vitamins are not energy producing foods. They speed up chemical reactions in the body. Vitamins are also known as protective nutrients because many diseases are caused by not eating the proper amounts of vitamins.

Vitamins were known 100 years ago. Doctors and nutritionists began naming them alphabetically, now they have run out of letters and they are giving them chemical names. Below is a listing of the important vitamins, which foods they are found in, and how they help the body.

| VITAMIN | GOOD FOOD SOURCE | FUNCTIONS |
|---|---|---|
| A | yellow vegetables, cod liver oil, egg yolk, butter, cheese | controls bone growth prevents night blindness, keeps skin and lining of nose, mouth and throat healthy and resistant to infection |
| $B_1$(thiamine) | pork, whole cereals, egg yolks | keeps nervous system healthy, normal appetite and digestion |
| $B_2$ (riboflavin) | liver, milk, meats | keeps eyes, skin and tongue healthy, prevents scaly skin around mouth and nose |
| $B_{12}$ | liver | prevents anemia |
| Niacin | bread, cereals, meats | keeps skin, mouth, tongue and digestive tract healthy keeps nervous system healthy |
| C (ascorbic acid) | citrus fruits, green vegetables | builds and keeps healthy all body tissues, keeps gums firm and prevents bleeding, helps in healing wounds and broken bones |
| D | sunlight, egg yolk, salmon | helps build good bones and teeth, prevents rickets |
| E | lettuce, whole wheat | helps in having normal pregnancy and normal birth |
| K | liver, cabbage, spinach | helps normal clotting of blood |

Some vitamins are stored in the body, others have to be consumed everyday. Vitamin $B_2$, niacin and Vitamin C are needed everyday. Some vitamins can be destroyed by cooking at very high temperatures. Those destroyed by heat are A, C and all the B's.

Enriched foods are those that have had vitamins added to them. Some foods like bread and cereal lose their vitamins when they are processed for storage. Vitamins are then added to bread, flour, rice and cereal.

QUESTIONS

1. What role do vitamins perform for your body?

2. What does a vitamin deficiency mean?

3. What is the function of Vitamin A and which foods have high concentrations of Vitamin A?

4. What is the function of Vitamin C and which foods have high concentrations of Vitamin C?

5. Which vitamins do you get from egg yolks?

6. Which vitamins are found in green vegetables (including lettuce and cabbage)?

7. Which vitamins are not stored in the body and are needed everyday.

8. What are enriched foods?

9. What is the sunshine vitamin?

10. Which vitamins are found in meats?

# EVERY MAIL DAY

Lyrics

If I can row (yeah)
Row a few days longer.
If I can row (yeah)
Row (yeah) a few days longer.
Then I'm goin' back home (boy)
Oh Lord, I'm goin' back home.

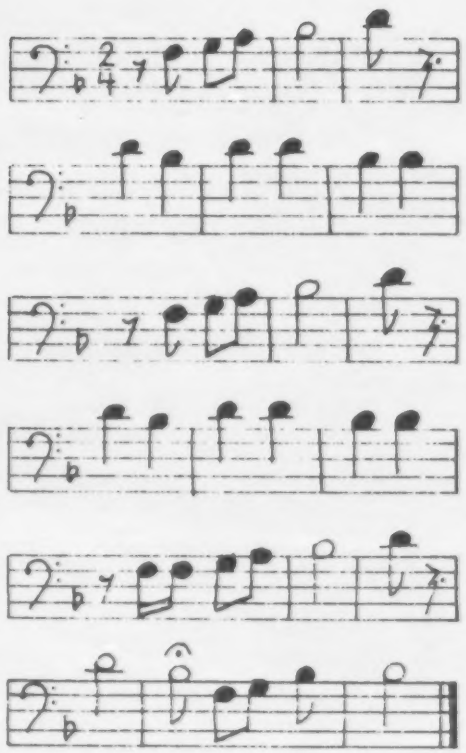
Well every mail day
Mail day, I gets a letter.
Well every mail day
Mail day, I gets a letter.
Sayin' daddy come home (boy)
Lord, Lord, daddy come home.

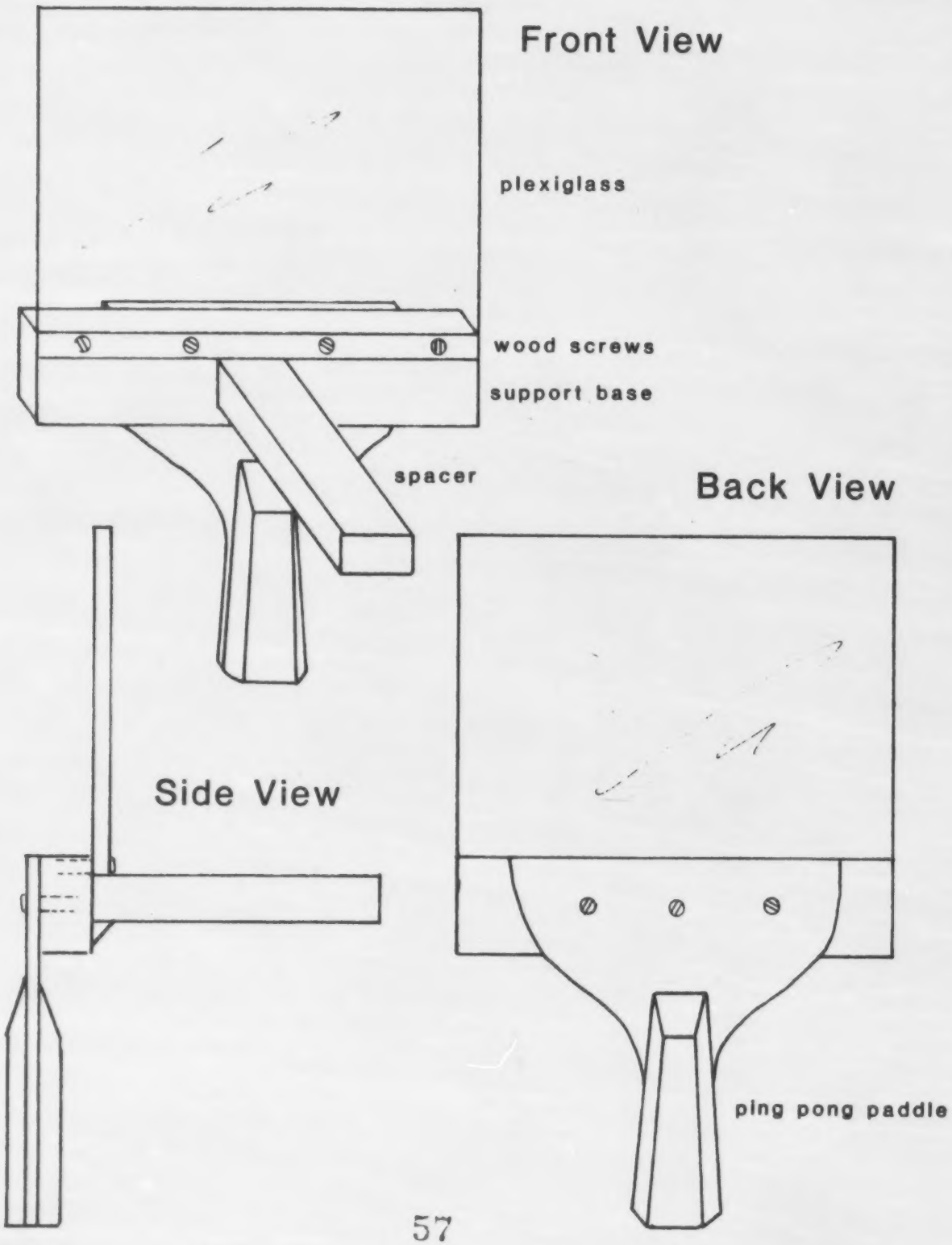
I would go home (boy)
I ain't got no ready made money.
I would go home (boy)
Ain't got no ready made money.
To pay my way (boy)
Oh Lord, to pay my way.

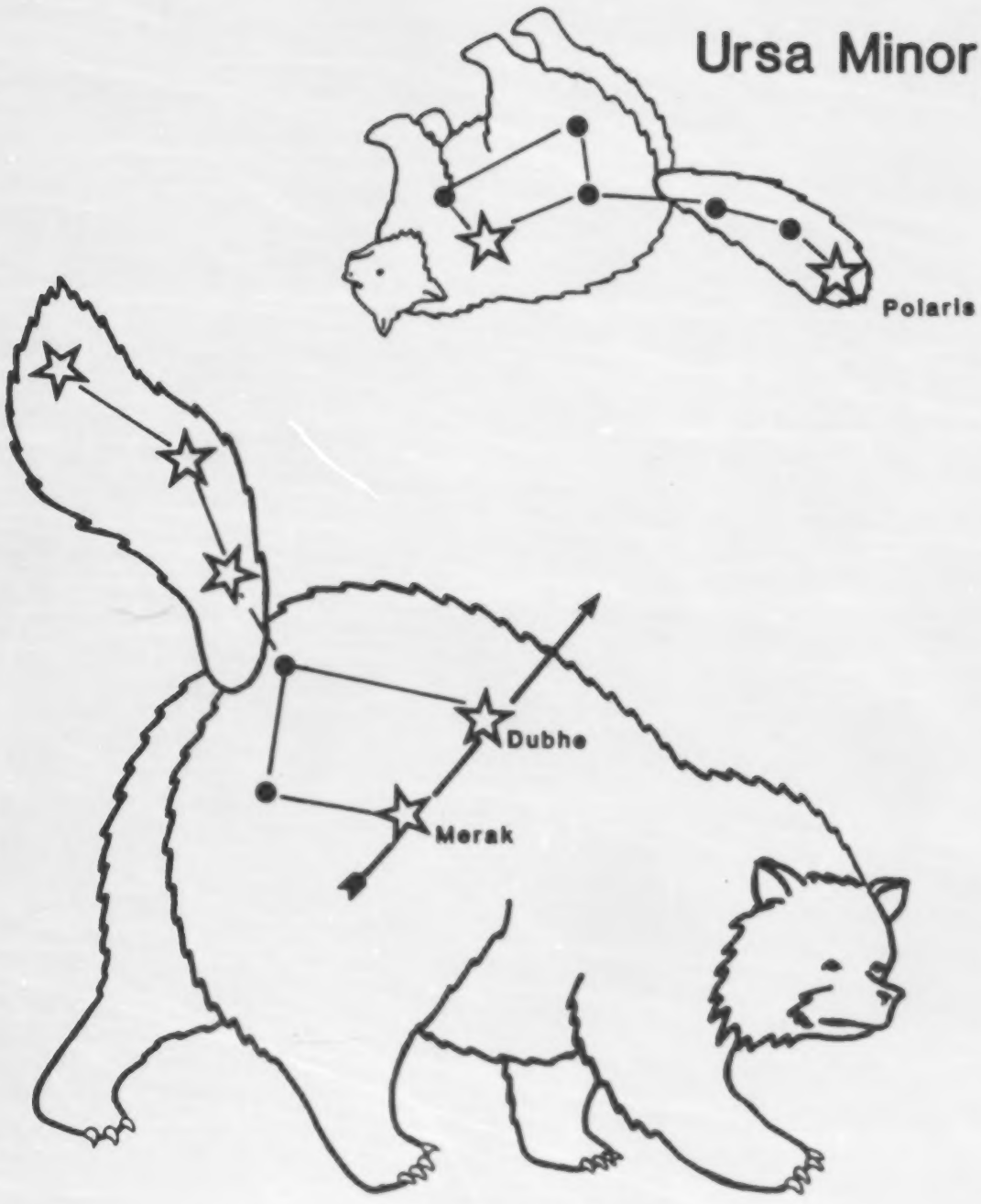
Oh Evaline,
She's got money 'cumulatin'.
Oh Evaline,
She's got money 'cumulatin'.
I love that girl (boy)
Lord, Lord, I love that girl.

Oh Jack o'Diamonds
Layin' right there on the bottom.
Oh Jack o'Diamonds
Layin' right there on the bottom.
Well who gonna raise him.
Lord, Lord, who gonna raise.

If I can row (yeah)
Row (yeah) few days longer.
If I can row (yeah)
Row (yeah) few days longer.
Then I'm goin' back home (boy)
Lord, Lord, I'm goin' back home.

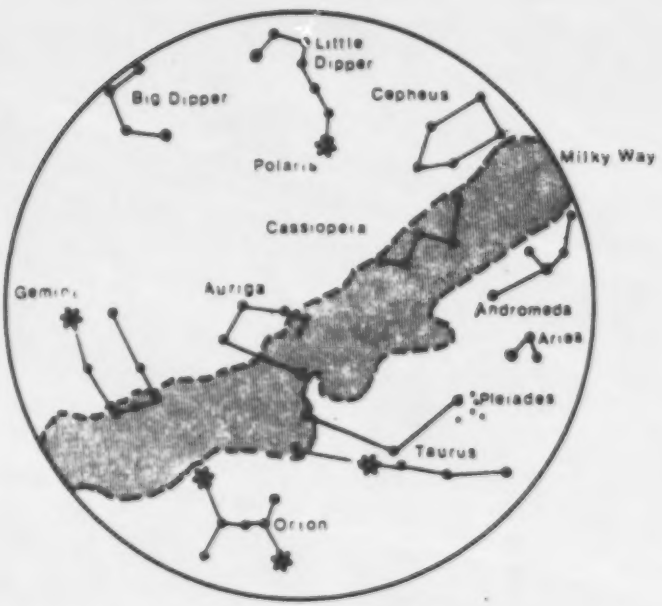
Musical Score

# Star Recorder




Ursa Minor
Polaris
Dubhe
Merak
Ursa Major

## Summer Constellations

## Winter Constellations



# STARFINDER CHART ACTIVITY SHEET

1. What is today's date?

2. Which direction are you facing?

3. Which bright stars are visible at 8 p.m.?

4. By moving the star chart disc to today's date at 9 p.m., which stars have disappeared under the horizon since 8 p.m.?

5. Which stars are at the zenith at 8 p.m. on today's date?

6. Which stars are at the zenith at 8 p.m. on your birthday?

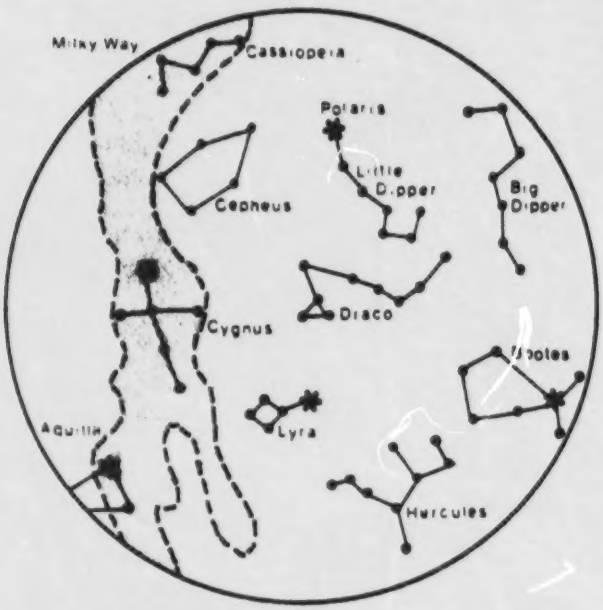
7. Draw the constellation that is at the zenith on January 1 at 8 p.m..

8. On which day(s) is the constellation Lynx at it's zenith at 10 p.m.?

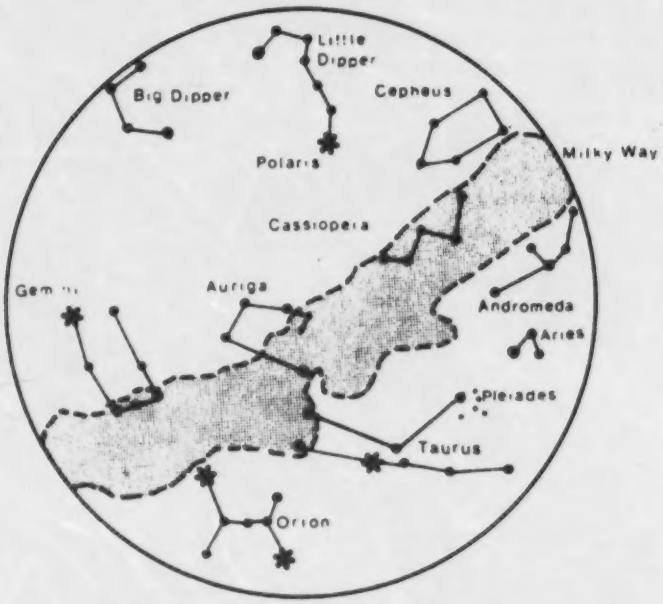
9. On which day(s) is the constellation Pyxis rising from the horizon at 7 p.m.?

10. What time on June 21 does Sagittarius become fully visible above the horizon?

## Summer Constellations




## Winter Constellations



# IROQUOIS STAR MYTHS

The Iroquois were a tribe of American Indians who lived in New York state. This is their story of the constellation Pleiades.

As the pleasant autumn days passed, the lodges had been built and the hunting had been prosperous. The children were getting lonesome with nothing to do while the rest were so busy. The children started meeting daily in a quiet spot by the lake to dance for their own amusement. They called it the jolly dance and they enjoyed it very much.

The children had been doing this for quite some time when an old man appeared out of the woods. They had never seen anyone like him. His white hair shone like silver and he was dressed in white feathers. He told them that they must stop their dancing or evil would come their way. The children said nothing but did not heed his warning. They continued to dance. Again and again the old man appeared and repeated his warning.

The children decided it would be more fun if they held a feast with their next dance. They would get the food from their parents. "You should eat at home," said one mother. "You will just waste good food," said another. The children were sorry about the food but decided to dance anyway. A little food after each dance would have made them happy, but empty stomachs brings no gladness.

One day as they danced, they found themselves rising little by little into the air, their heads being light with hunger. The children did not understand what was happening, one child called to the others, "Do not look back, something strange is taking place." A woman saw them and called them back, to no avail. They still rose slowly from the earth. The woman ran calling to the camp. The people all came out with all types of food, crying and begging them to return. The children would not, in fact, could not, return. One child looked back and became a falling star. The others reached the sky and are now what is called Pleiades and "Oot-kwa-tah" to the Indians. Every falling or shooting star recalls the story to them, the seven stars shine on continuously, a merry band of children.

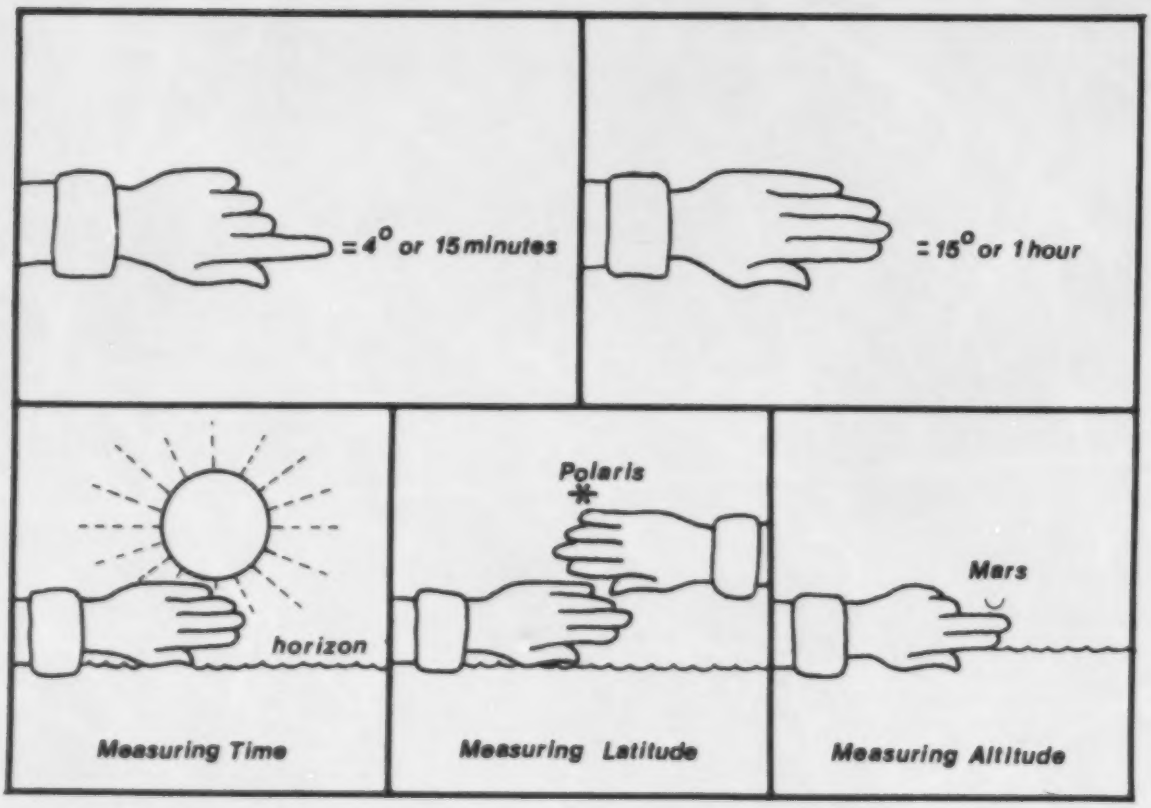
---

Beauchamp, Rev. William M. Iroquois Folk Lore, Empire State Historical Publication XXXI. New York: Ira J. Friedman, Inc. 1922.

TIME, ALTITUDE AND LATITUDE

MEASURE WITH YOUR HAND

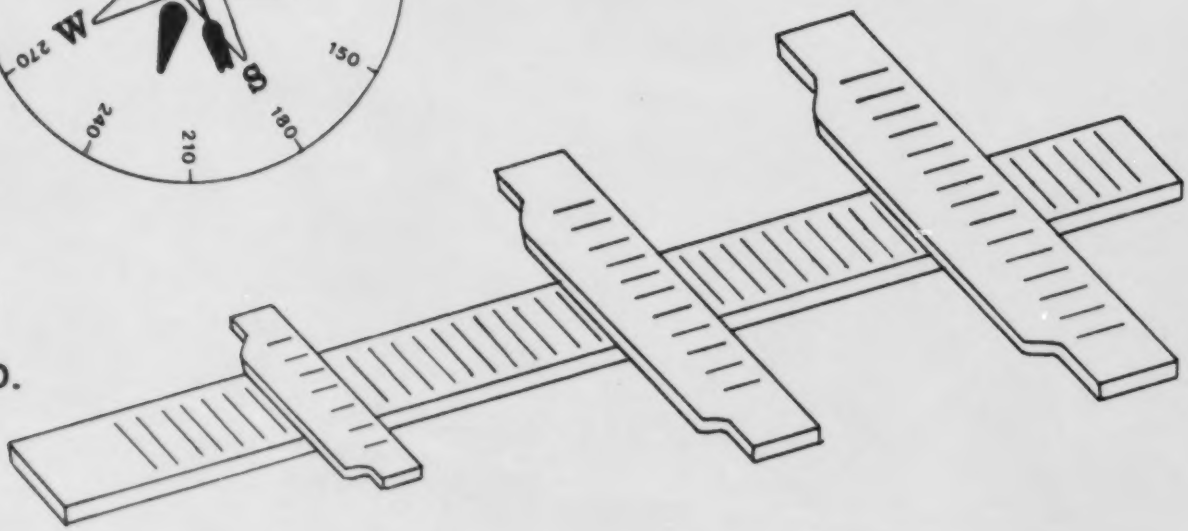
1. Face the sun or star.
2. Keep your arms straight.
3. Hold your thumb against the palm of your hand.
4. Start at the horizon and count hand over hand until you reach the object in the sky.
5. Remember these measurements.



a.

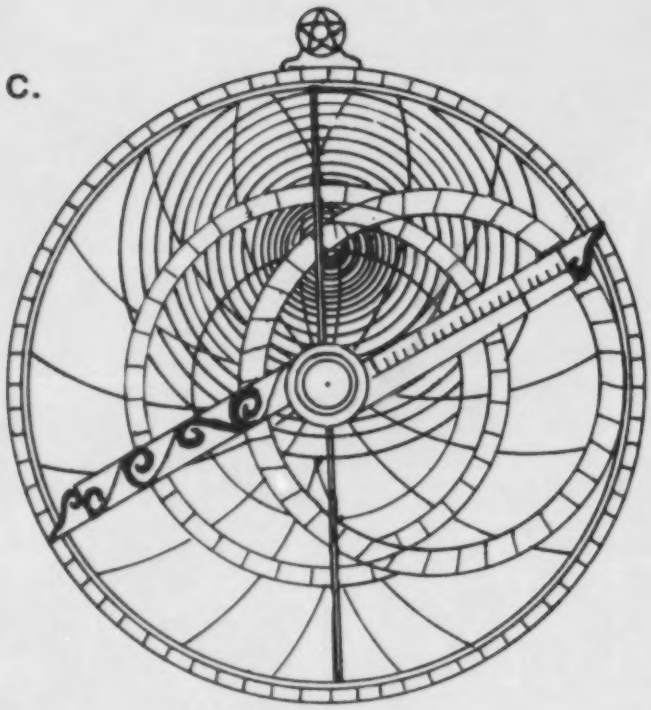
Compass

b.



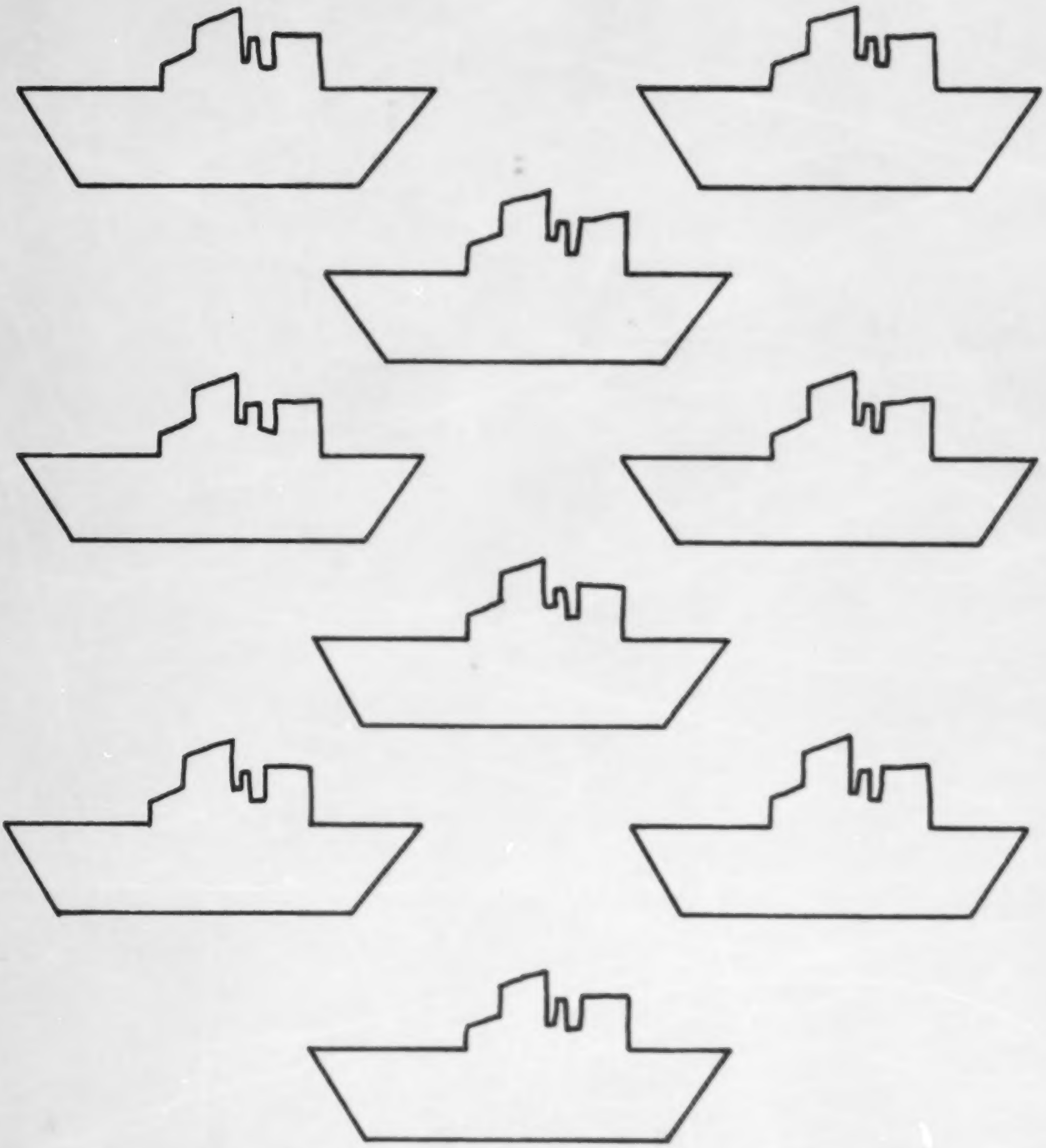
Cross-staff

c.

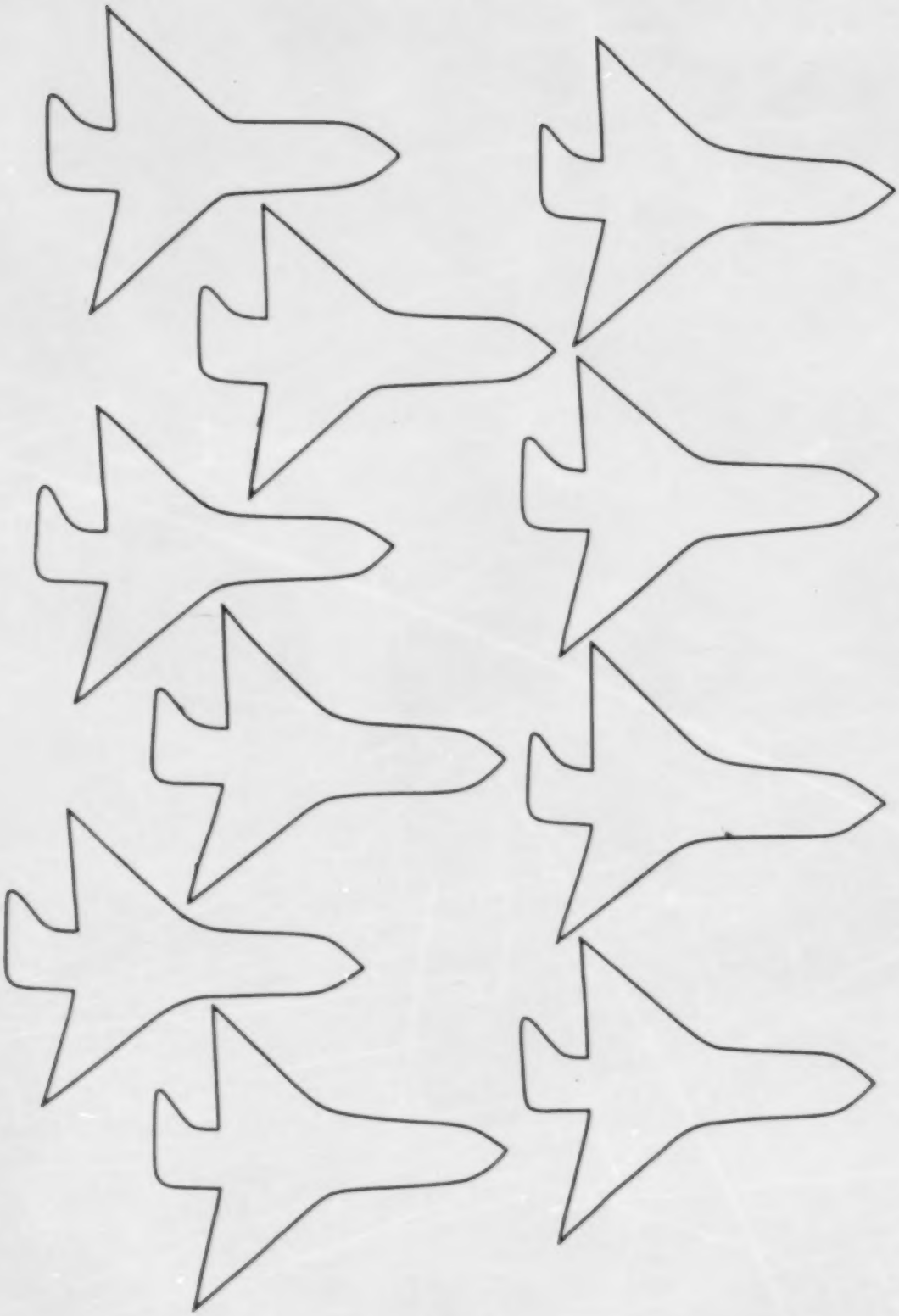


Astrolabe

5-6b
8.3



5-6b
8.4



STUDENT ACTIVITY SHEET

Latitude and longitude lines have been drawn on maps and globes to help one find his/her position. Latitude lines are horizontal on maps and globes. The $0^{o}$ latitude is the equator and the North Pole is $90^{o}$ north latitude. Latitude lines above the equator are written with a capital N after the number and degree. Most of North Carolina is located between $34^{o}N$ and $36\frac{1}{2}^{o}N$ latitude.

Longitude lines run vertically from the North Pole to South Pole. The $0^{o}$ longitude line runs through Greenwich, England and is called the Prime Meridian. Longitude lines west of the Prime Meridian are written with a capital W after the number and degree. Most of North Carolina is located between $84^{o}W$ and $75^{o}W$.

The location of Cairo is $30^{o}N$ latitude and $30^{o}E$.

Complete the questions and sentences, using globes, map and charts.

1. What is the location of Washington, D.C.?

2. List the countries that the $0^{o}$ latitude line runs through.

3. Which longitude runs through Greenland?

4. Name the European city that has the location of $44^{o}N$ and $3^{o}E$.

5. The _____ is the $0^{o}$ longitude line.

6. The _____ is the $0^{o}$ latitude line.

7. What is the location of Quito, Equador?

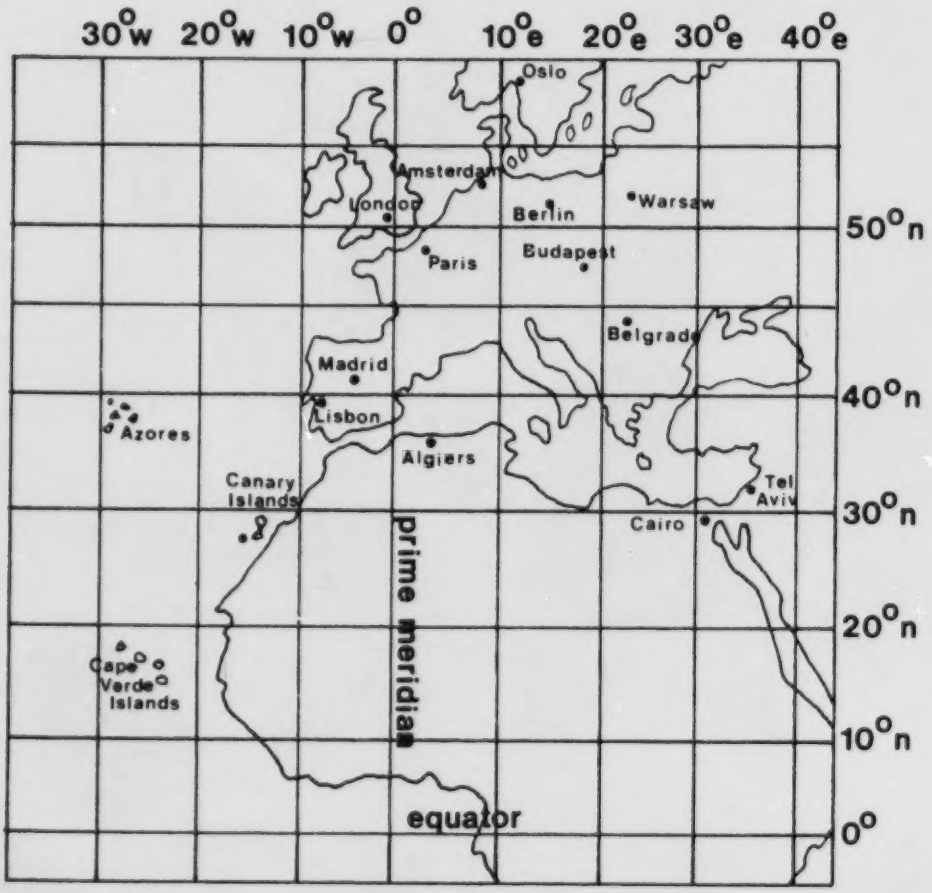
8. What city is located near $30^{o}N$ and $30^{o}E$?

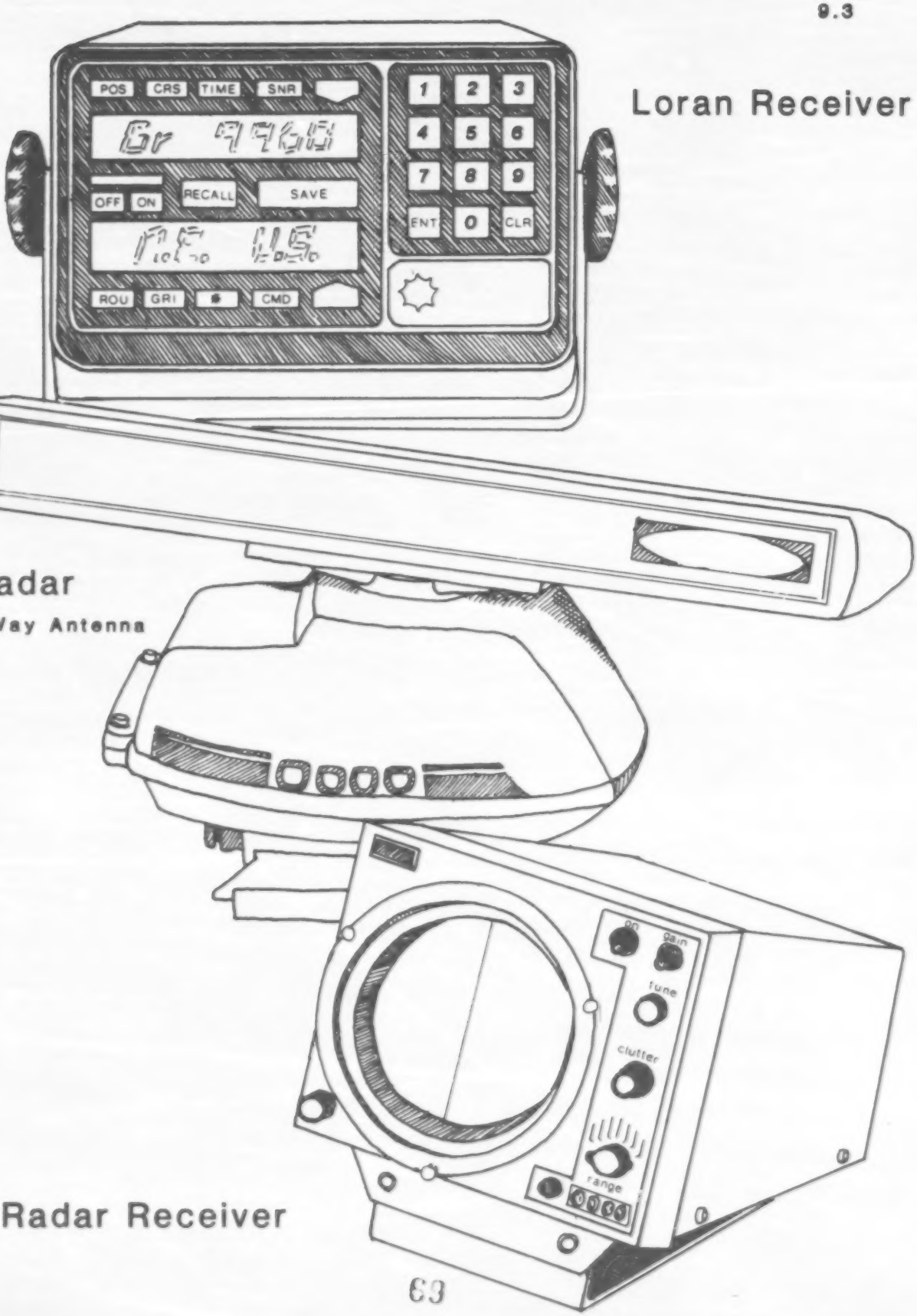
9. Give the approximate location of the Canary Islands.

10. What city is located near $52^{o}N$ and $15^{o}E$?

## Latitude Lines

## Longitude Lines






Loran Receiver

Radar

Two Way Antenna

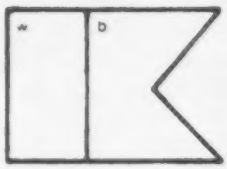
Radar Receiver

## NAVIGATIONAL EQUIPMENT ADDRESSES

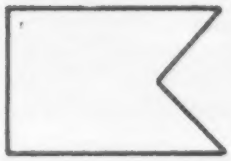
Product information brochures on electronic navigational equipment may be obtained from these companies. This information is provided for teachers who are not able to contact marine navigational equipment stores.

| EQUIPMENT | COMPANY |
|---|---|
| FCV-110/111 Sounder | Furuno U.S.A. Inc.<br>Dept. NF-09<br>P.O. Box 2343, 271 Harbor Way<br>South San Francisco, CA 94080 |
| VRM/VRD 125 Radar | Racal-Decca Marine Inc.<br>P.O. Box 6<br>#1 Commerce Blvd.<br>Palm Coast, FL 32037 |
| TI9900 Loran C Navigator | Texas Instruments Inc.<br>Marine Products<br>P.O. Box 226080, MS 3107<br>Dallas, Texas 75266 |
| HE 351 Series Fish finder | Si-tex<br>P.O. Box 6700<br>Clearwater, FL 33518 |
| Standard Horizon USA radio | Standard Communications<br>P.O. Box 92151<br>Los Angeles, CA 90009 |

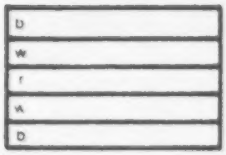
A alpha



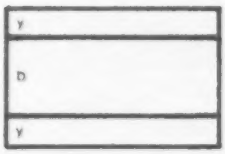

B bravo




C charlie

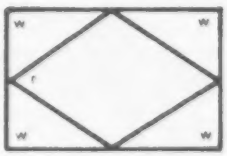



D delta

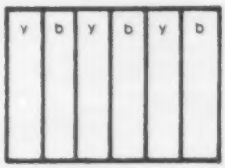



E echo

F foxtrot

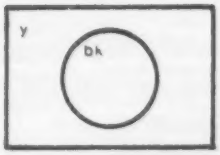



G golf



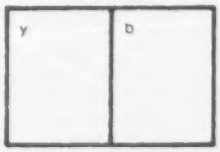

H hotel

I india

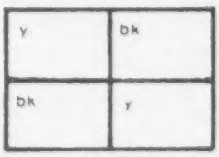



J juleitt

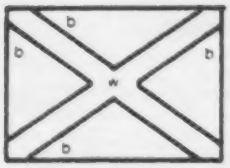
K kilo



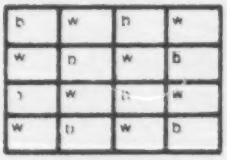

L lima



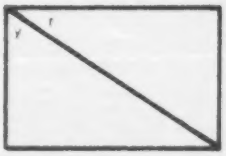

M mike



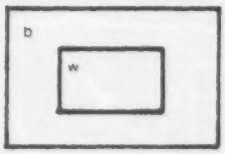

N november



O oscar

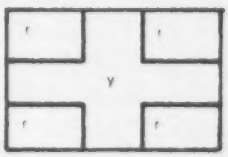



P papa




Q qubec

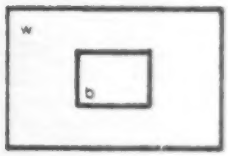
R romeo



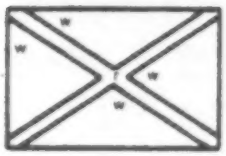

COLOR KEY

b blue bk black
r red w white
y yellow

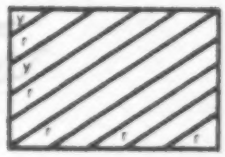
S sierra



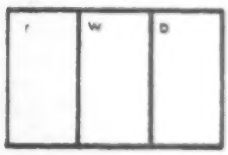

V victor



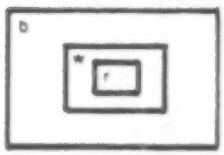

Y yankee



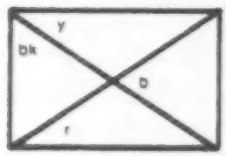

T tango




W whiskey




Z zula

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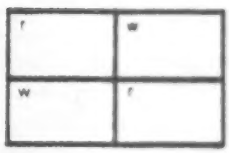


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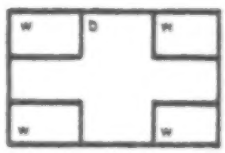


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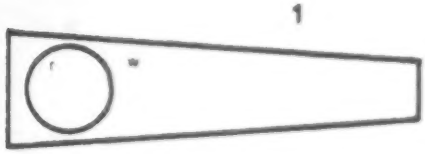


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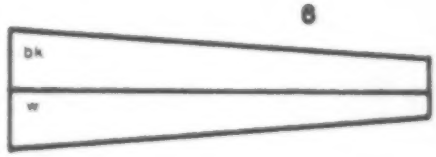


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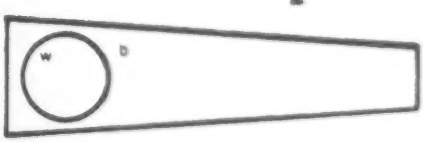


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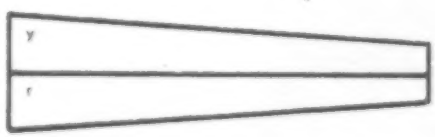


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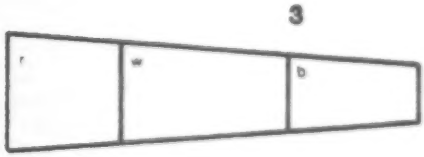


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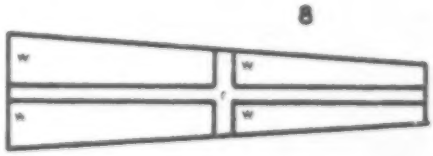


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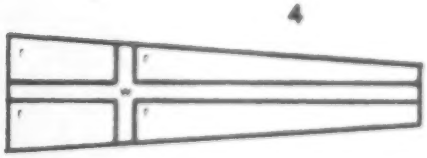


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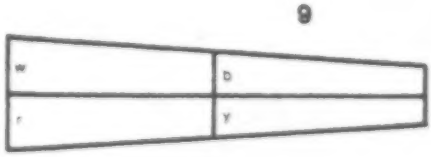


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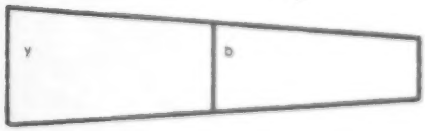


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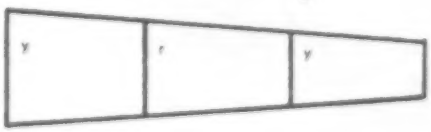


## SINGLE LETTER SIGNALS

A - I have a diver down; keep well clear at slow speed.

B - I am taking in, or discharging, or carrying dangerous goods.

C - Yes (affirmative or "The significance of the previous group should be read in the affirmative").

D - Keep clear of me; I am maneuvering with difficulty.

E - I am altering my course to starboard.

F - I am disabled; communicate with me.

G - I require a pilot. When made by fishing vessels operating in close proximity on the fishing grounds it means: "I am hauling nets."

H - I have a pilot on board.

I - I am altering my course to port.

J - I am on fire and have dangerous cargo on board; keep well clear of me.

K - I wish to communicate with you.

L - You should stop your vessel instantly.

M - My vessel is stopped and making no way through the water.

N - No (negative or "The significance of the previous group should be read in the negative"). This signal may be given only visually or by sound. For voice or radio transmission the signal should be "NO".

O - Man overboard.

P - In harbor - All persons should report on board as the vessel is about to proceed to sea.
At sea - It may be used by fishing vessels to mean: "My nets have come fast upon an obstruction."

Q - My vessel is "healthy" and I request free pratique.

S - My engines are going astern.

T - Keep clear of me; I am engaged in pair trawling.

U - You are running into danger.

V - I require assistance.

W - I require medical assistance.

X - Stop carrying out your intentions and watch for my signals.

Y - I am dragging my anchor.

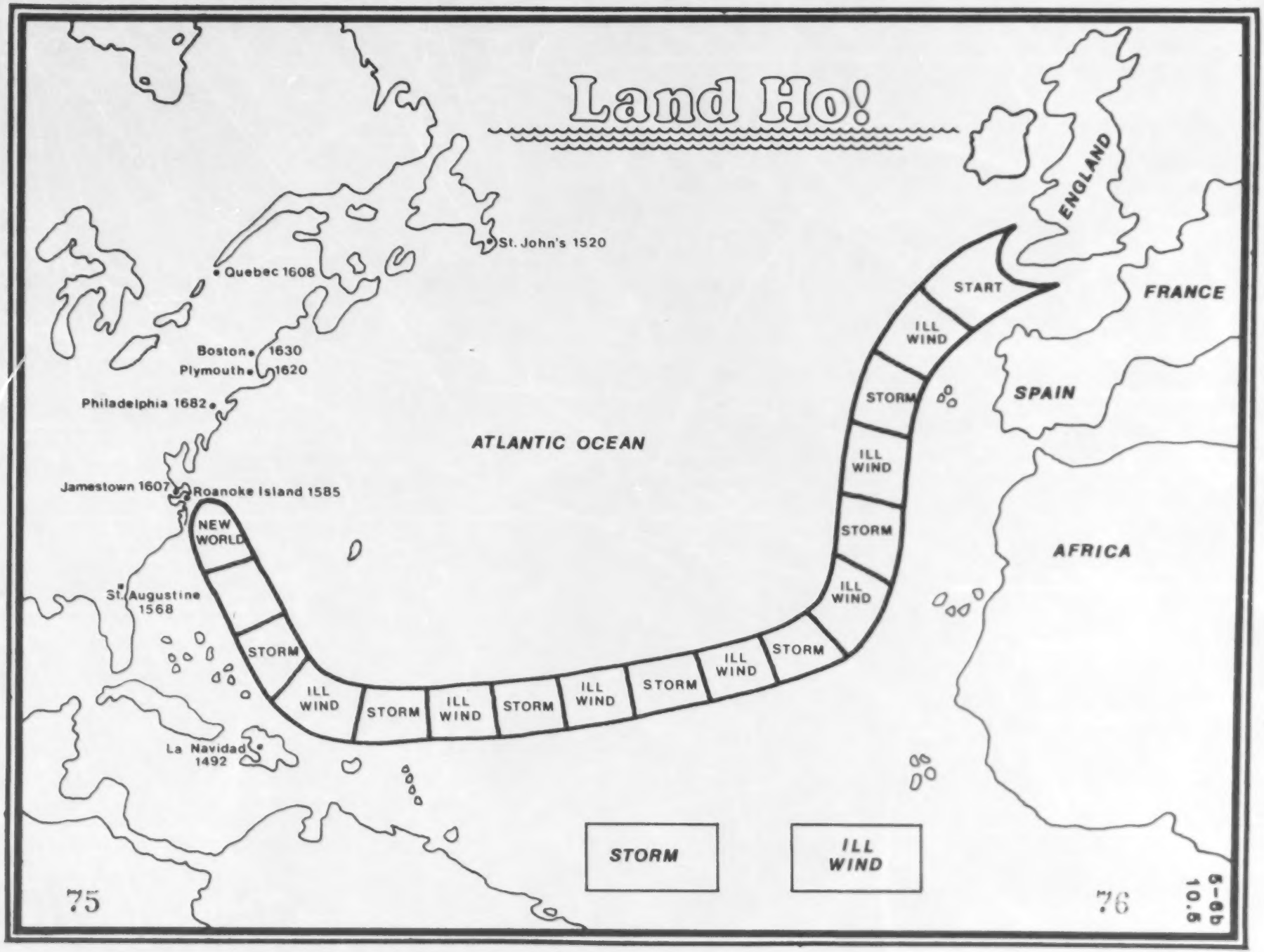
Z - I require a tug. When made by fishing vessels operating in close proximity on the fishing grounds it means: "I am shooting nets."

# LAND HO!

The object of the game is to safely navigate your vessel from Europe to the New World. The game is designed for two to four players.

## DIRECTIONS

1. Roll the die to determine the order of the players. Each player chooses a sailing vessel token and places it on START.
2. Roll the die and move the token the number of spaces indicated.
3. If a player should land on a STORM space, the player must pick up a STORM card and answer the question correctly to keep his/her position. If the player does not answer correctly, the player will move his/her token backwards two spaces.
4. If a player should land on an ILL WIND space, the player must pick up an ILL WIND card and answer the question correctly to maintain his/her position. If the player does not answer correctly, the player will move his/her token backwards two spaces.
5. The first player to reach the New World is the winner.


Land Ho!
ENGLAND
FRANCE
SPAIN
AFRICA
ATLANTIC OCEAN
St. John's 1520
Quebec 1608
Boston 1630
Plymouth 1620
Philadelphia 1682
Jamestown 1607
Roanoke Island 1585
St. Augustine 1568
La Navidad 1492
NEW WORLD
START
ILL WIND
STORM
ILL WIND
STORM
ILL WIND
STORM
ILL WIND
STORM
ILL WIND
STORM
ILL WIND
STORM
STORM
ILL WIND
75
76
5-6b 10.5

| | |
|---|---|
| STORM | STORM |
| STORM | STORM |
| STORM | STORM |

| | |
|---|---|
| 1. DEFINE CONSTELLATION. | 2. GIVE THE DEFINITION OF LATITUDE. |
| 3. WHAT IS A MYTH? | 4. WHAT DID EARLY NAVIGATORS USE TO FIND THEIR WAY AT NIGHT? |
| 5. GIVE THE NAME OF A WINTER CONSTELLATION. | 6. DESCRIBE THE USE OF HARDTACK. |

| | |
|---|---|
| 7. GIVE THE DEFINITION OF A NAVIGATOR. | 8. SING FOUR LINES OF A SEA CHANTY. |
| | |
| | |

5-6b
10.9

| | |
|---|---|
| ILL WIND | ILL WIND |
| ILL WIND | ILL WIND |
| ILL WIND | ILL WIND |

| | |
|---|---|
| 1. EXPLAIN WHY THE EUROPEAN VOYAGES OF THE 15th AND 16th CENTURY BEGAN. | 2. WHAT IS SCURVY? |
| 3. WHO WAS SIR WALTER RALEIGH? | 4. FOR WHAT WAS AN ASTROLABE AND CROSS-STAFF USED? |
| 5. WHAT IS A CHRONOMETER? | 6. NAME THREE PIECES OF MODERN ELECTRONIC NAVIGATIONAL EQUIPMENT. |

| | |
|---|---|
| 7. WHAT DOES LORAN STAND FOR? | 8. WHAT IS GROG? |
| | |
| | |

## STORM - QUESTION CARDS

### ANSWER KEY

1. Define constellation. (A pattern or grouping of stars.)

2. Give the definition of latitude. (Latitude lines run horizontally around globes. Latitude lines are numbered $0^{0}$ at the equator and increase to $90^{0}$ at the poles.)

3. What is a myth? (A myth is a story that explains events or phenomena.)

4. What did the early navigators use to find their way at night? (The navigators used the moon and stars, they determined altitude and then calculated their latitude.)

5. Give the name of a winter constellation? (Orion, the Hunter; Canis Major, the Big Dog; Taurus the Bull.)

6. Describe the use of hardtack. (Hardtack was a biscuit that sailors ate.)

7. Give the definition of a navigator. (Navigators read maps and determined the location of the vessel and decide in which direction to sail.)

8. Sing four lines of a sea chanty. (The songs will vary according to the songs the students know.)

## ILL WIND - QUESTION CARDS

### ANSWER KEY

1. Explain why the European voyages of discovery of the 15th and 16th century began. (The eastern trading routes to the Orient were cut off by the Turks and the Europeans tried sailing west to reach the Orient.)

2. What is scurvy? (Scurvy is a Vitamin C deficiency disease resulting in weakness, bleeding gums, bleeding under the skin and can result in death.)

3. Who was Sir Walter Raleigh? (Sir Walter Raleigh was authorized by Queen Elizabeth I of England to discover and start colonies in the New World.)

4. For what was an astrolabe and cross-staff used? (Astrolabes and cross-staffs were navigational equipment used by navigators to determine altitude of stars, sun and moon to calculate latitude.)

5. What is a chronometer? (A chronometer is an accurate timepiece used on sea vessels to help determine longitude.)

6. Name three pieces of modern electronic navigational equipment? (Radar, Sonar, Loran, inertial guidance systems, shoran, depth finders and short wave radio.)

7. What does Loran stand for? (Long range navigation.)

8. What is grog? (A fermented alcoholic drink usually rum mixed with water and carried on sailing vessels because of no fresh water sources.)

# NAVIGATION TEST

1. A constellation is

   a. a pattern of stars.

   b. a star outside our universe.

   c. a satellite circling other planets.

   d. a planet in our solar system.

2. Which conditions did not exist on a 16th century sea vessel?

   a. Meals that were prepared from salted or dried foods.

   b. Beetles and mealworms were picked out of the bread.

   c. Sea chanties were sung to help keep the rhythm in their work.

   d. Citrus fruits were eaten every day to ward off the disease, scurvy.

3. The European voyages of discovery of the 15th and 16th century began because

   a. Europe was getting too crowded and the new lands would hold the extra people.

   b. the eastern land routes to the Orient were closed and Europeans started sailing West to look for silks and spices.

   c. France defeated England in a war and the English noble families escaped in sea vessels to the New World.

   d. there was a plague in Europe and the people tried to escape to new healthier lands.

4. Diaries were written to

   a. keep an accurate record of events.

   b. express secret feelings in a private manner.

   c. explain the captain's decisions.

   d. all of the above.

5. Polaris, our best known position star, is often called the

   a. Star of the East.

   b. South Star.

   c. Great Western Star.

   d. North Star.

6. Three well known "winter constellations" are

   a. Falcon, the Sky Hawk; Zeus, the Night God; and Diana, the Archer.

   b. Orion, the Hunter; Canis Major, the Big Dog; and Taurus, the Bull.

   c. Leo, the Leopard; Poseidon, the Sea King; and Arbor, the Woodsman.

   d. Regina, the Queen; Rex, the King; and David, the Shepard.

7. When using a star-finder chart, the position directions appear this way:

   a. N / W E / S  b. N / E W / S  c. S / W E / N  d. S / E W / N

8. People of long ago created myths about constellations because

   a. it was easier to find the constellation if there was a story to remind you of the shape.

   b. if they did not understand something (movement of constellations) they made up stories for explanations.

   c. they believed the constellations could foretell good and bad events.

   d. all of the above.

9. Cross-staffs and astrolabes

   a. were used to calculate altitude of stars so sailors could find their latitude before the 19th century.

   b. were made illegal in the 1920's when they caused two ships to collide.

   c. were used on cruise lines to calculate longitude.

   d. were used to calculate depth of water.

10. Modern navigational equipment

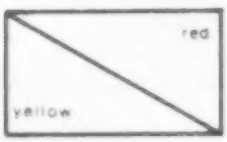
   a. includes such things as radar, sextants and loran.

   b. depends heavily on electronic equipment.

   c. still based on finding one's latitude and longitude the same as in primitive navigation.

   d. all of the above.

11. If you were in a boat and you approached a boat flying this flag,




What would it mean?

a. Man overboard.
b. I'm carrying dangerous cargo.
c. I am disabled, communicate with me.
d. You are running into danger.

# NAVIGATION TEST

## ANSWER KEY

1. a
2. d
3. b
4. d
5. d
6. b
7. b
8. d
9. a
10. d
11. a